

SCIENCE

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SOME NEW ELECTRIC RAILWAYS.

WE present in this issue a view taken from a photograph, last summer, of one of the electric cars on the Naumkeag Street Railway of Salem, Mass., of which Mr. Charles F. Odell is president. This electric road was equipped during the past year by the Sprague Electric Railway and Motor Company of New York, for the summer traffic between the city of Salem and a watering-place about a mile or two away, known as the Willows.

The cars ran very successfully all last summer while in use, carrying large numbers of passengers, and giving perfect satisfac-

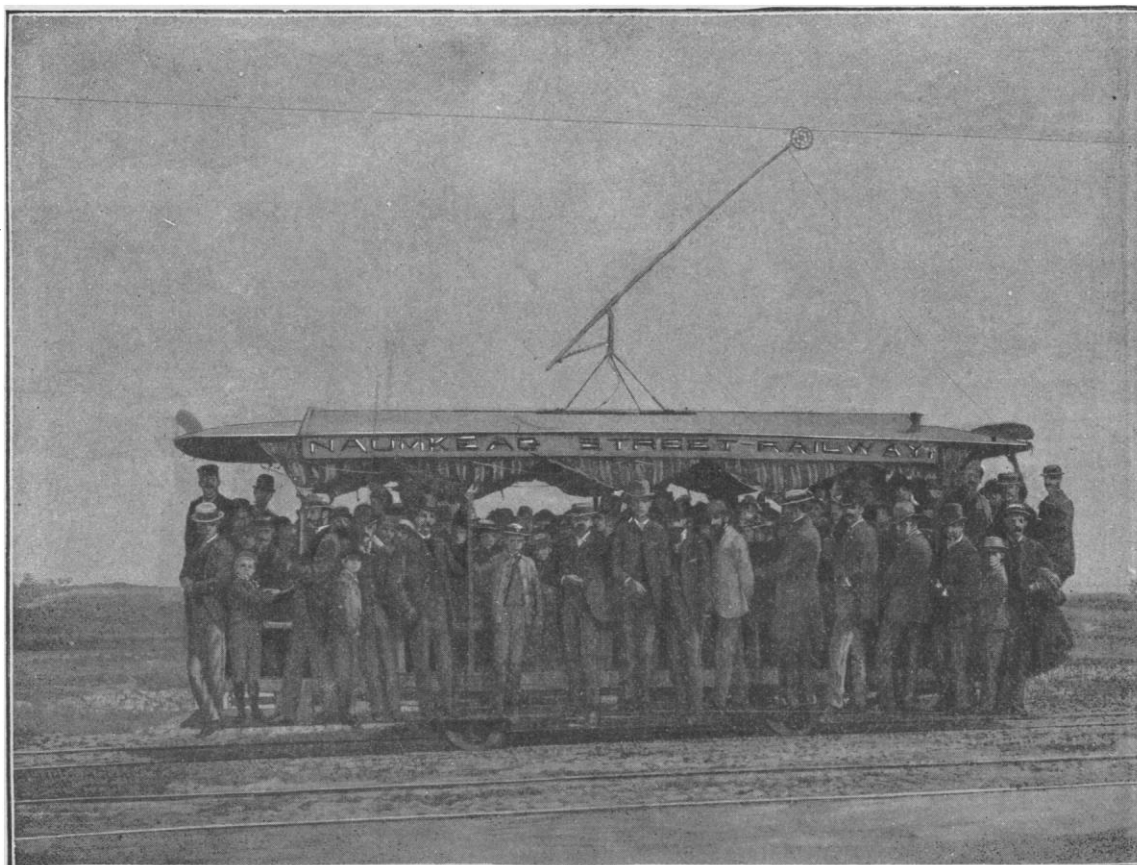
tion to the president and directors of the road, who, it is said, intend adding more electric cars in the spring, and extending the line as far as Beverly.

The illustration which we give presents a good idea of the large number of passengers which these cars often carry on pleasant days during the summer. In spite of the heavy load, these cars move with quickness and despatch, and mount the steep grades on the line at the rate of eight or ten miles an hour. These grades, before the introduction of electric power on the road, have often compelled horses to succumb in drawing the heavily loaded cars.

The regular Sprague overhead system in use upon the road here

includes the small No. 6 wire as a working conductor, which is the only wire suspended over the centre of the track; the main current being carried at the side upon a heavy copper conductor, which is connected at intervals of every one or two hundred feet to the working conductor.

One of the most important electric railways in the country is that in operation at Cleveland, O., also on the Sprague system. We present a view on the road, showing one of the Sprague cars drawing another on Euclid Avenue. The road has been in operation now for about a month, and has carried a large number of passengers, who are delighted with the new motive power, and the



SPRAGUE ELECTRIC RAILWAY AT SALEM, MASS.

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quickness with which the cars can be started and stopped, their speed, and the ease with which they mount the grades and round the curves. The lighting of the cars by electricity is another great advantage.

The equipment of this road is similar to that of the Sprague Electric Road in Boston, Mass. The poles used are of iron throughout the entire length of the line, and the overhead work is unobtrusive, making the whole line-work unobjectionable. The power-station for generating the current is one of the most complete of its kind in the country. It is fitted with Edison dynamos, Armington & Sims engines, and every thing is so arranged that its

capacity can be easily quadrupled without changing the line of machinery.

Since the road has been in operation, it has been visited by delegations from all sections of the country, of railroad men, who have inspected the operation of the road with the view of introducing the Sprague system upon their own lines. The East Cleveland Railway Company have afforded them every opportunity for inspection, and the result has been that a large number of contracts since the opening of the road have been awarded to the Sprague Company.

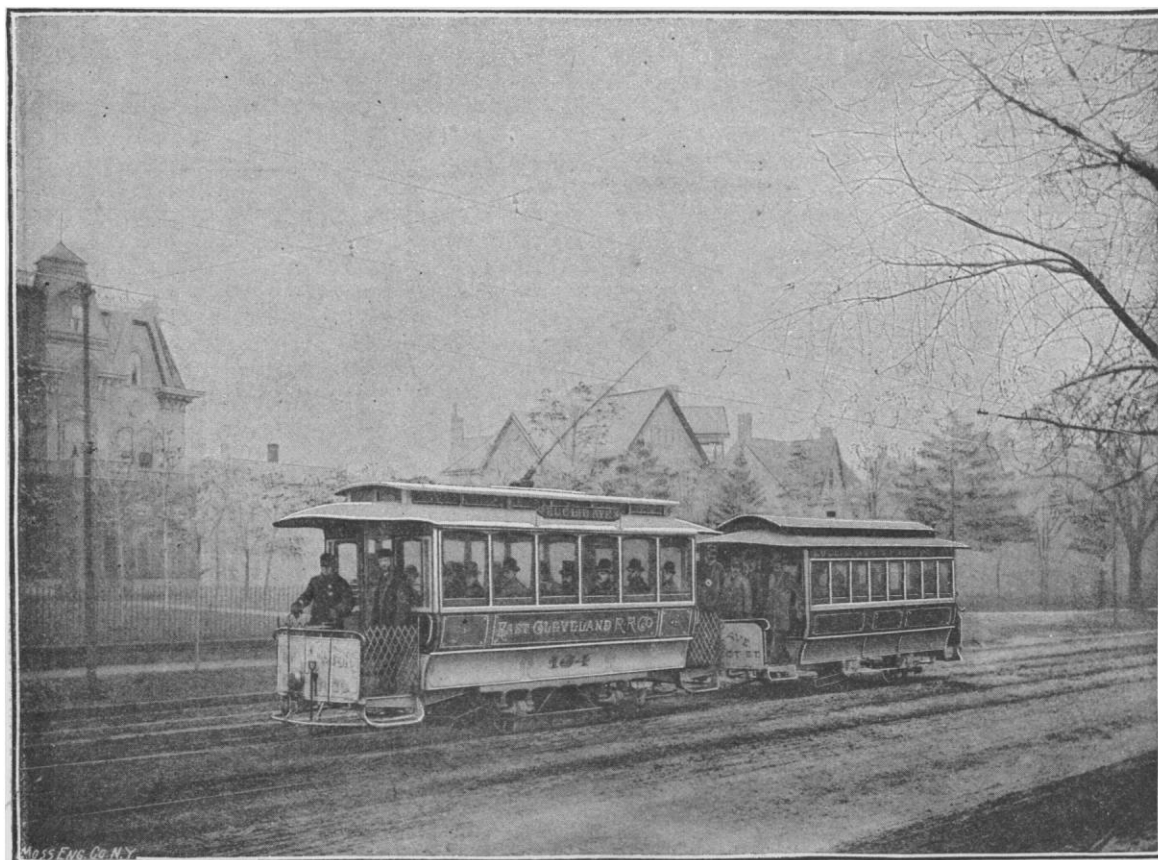
In a recent snow-storm which occurred in the city of Cleveland, the tracks were all covered to a depth of from six to eight inches; and the horse-railways in that city were delayed in their trips, and only ran intermittently. The electric road, on the other hand, made regular trips, ploughing its own way through the drifts, and successfully demonstrating the advantages of electrical

On account of the perfect regularity of speed which is the characteristic of these motors, on account of their differential winding, they are peculiarly adapted to the operation of printing-presses. There are also several machine-shops, carpenter-shops, and elevators which are using the Sprague motors.

HEALTH MATTERS.

Climate of Colorado.

DR. WALTER A. JAYNE presented an exceedingly interesting paper, on "The Climate of Colorado and its Effects," to the American Climatological Association at its recent meeting. In his paper he discusses the air of Colorado both as to atmospheric pressure and dryness. The annual rainfall is between fifteen and sixteen inches, — a small amount as compared with the United States in



SPRAGUE ELECTRIC RAILWAY AT CLEVELAND, O.

over animal power. The Sprague Company are now equipping snow-ploughs, to be operated by powerful electric motors, for this road; so that no snow, however deep, will be able to stop the running of the cars. It is estimated that these electric ploughs will clear the tracks quicker than an ordinary plough drawn by a dozen horses.

Among the cities which are coming into prominence in the Southern States, there is none probably in which the application of electricity for industrial purposes has received greater attention, and been more extensively applied, than in Asheville, N.C. We gave a description, in a recent issue, of the successful opening of the electric railway which connects the city of Asheville with the railroad-depot, distant about a couple of miles, which has been running successfully.

Although possessing a successful railway, the attention of the Asheville citizens in regard to electric power has not been devoted exclusively to railway-work; but there are a number of stationary motors in the city which are giving satisfaction. Both the Asheville *Citizen* and *Country Homes* are printed by electric power.

general. The winds are at times disagreeable and annoying by reason of the dust, but no injurious effects result from them except physical discomfort. In concluding his paper, he says that there are one or two very simple rules which all consumptives coming to high altitudes should understand and observe, since, because of the unusual characteristics of the climate, they are so important that neglect of them will retard recovery, and in advanced cases may destroy the slight chance still remaining to the invalid of receiving benefit from the change, and lead to a fatal result.

1. The approach to elevated regions should be gradual and by easy stages, not, in these days of Pullman coaches, to spare fatigue, but in advanced cases with limited lung space, and in those with fever and considerable activity of the disease, to avoid over-taxing the capacity of the lung to adapt itself to the rarefied atmosphere. For the same reason the invalid should, for a time after arrival, either take very moderate exercise or none at all.

2. The residence should be continuous and prolonged.

He is confident, that, were the first of these rules more generally followed, we should hear far less of the ill effects of high altitudes,

and be able to note a larger percentage of advanced cases as improved; and if the second was faithfully observed, there would be more cures and fewer relapses.

Overcoats.

The custom in this country is so prevalent of wearing heavy overcoats, whether one is outdoors or seated in overheated cars, that the remarks of the *London Lancet* on this useful garment will probably find interested readers. The teaching of modern science and of ancient custom goes to show that heat-production within the body has much to do with the tissue changes concerned in muscular activity and with healthy digestion. It is conserved by warm and moderate, wasted in evaporation by excessive clothing. Finally, by a simple nervous re-action, it is increased after the contact of external cold.

It follows from these observations, that, if we be so clad with comfortable underclothing that surface perspiration is not formed in excess, and is rapidly removed, one great cause of chill — sudden evaporation — is done away with. Outer cold, then, provided it is not too severe, only touches, as it were, the spring of the heat-making metabolism, and, exciting an elastic rebound in the chain of vaso-motor fibres, awakens that oxidative action by which every tissue is made to yield its share of heat to the body. This bracing influence is lost wholly or partly to those who are too heavily clothed, and in its place we may have a dangerous excess of surface heat. It is for this reason that the *Lancet* has before protested, as it now does, against the indiscriminate use of the thick and heavy overcoat; and it thinks that men in fairly robust condition, especially if young, should be clad warmly next the skin, and wear either a light top coat or none at all.

There can be no doubt that the habitual use of great-coats is indirectly accountable for the chills which they are intended to prevent. Were the overcoat worn continuously, it might attain its object. Its intermittent use, even when ample underclothing is worn, affords no solid guaranty of safety, but rather the reverse. The man of sedentary habits has especial need to remember this. He emerges daily from a warm breakfast-room clothed in his ordinary winter garments, with probably woollen underwear, and over all the heavy ulster or top coat. After a short walk he finds that the sense of warmth he began with is more than maintained. He arrives at his office or place of business, and off goes the overcoat, though the air of the newly opened room is as cold as that without, and draughty in addition. During the day perhaps he travels to and from adjacent business-houses, wearing only his house clothing. The overcoat is laid aside till closing time reminds him of the journey home. The frequent result is, that somehow, between the hours of his departure and return, he is chilled. No doubt he would run as great a risk if, lightly clad, he were to face the rigor of a winter day. In this case, however, exercise and habit might do much to develop the power of endurance, and there would, at all events, be less danger of sudden cold acting upon a freely perspiring surface. Woollen underclothing represents a state of healthy comfort intermediate between these extremes, and more resistant to chill than either.

In commending its use, however, the *Lancet* does not assert that the influence of age and constitution is to be overlooked. Youth can oppose a power of resistance to depressing agencies which does not reside in the worn-out nerve-centres of a riper age. Similarly, that elastic re-action which characterizes the nervous and sanguine types is not to be looked for in the lax tissues of the lymphatic. The weaker physique naturally calls for fuller protection than the stronger; and any rule requiring the disuse of the overcoat should allow of reasonable exceptions in favor of the old and constitutionally feeble. Unusual severity of weather, especially if associated with night air and the loss of sleep which this implies, is another condition which might well constitute an exception. In such a case we are compelled to add some form of overcoat to the ordinary amount of clothing. Some parts of the body — for example, the chest, throat, and feet — are certainly more susceptible to cold than others. As a useful safeguard, cold or tepid bathing of such parts is in merited favor. The custom so common with many persons, especially women, of walking out in thin-soled boots, often plays an important part in catching cold.

The progress of time and of rational thought may be expected to bring in a more comfortable arrangement by clothing the foot in woollen hosiery and a stouter boot.

SWINE OR MAN. — It is said that more money has been spent by the United States Government in the investigation of the diseases which affect swine than of those which affect the human species.

AIR AND WATER ANALYSES. — Modern investigators are not satisfied with chemical analyses of drinking-water and air as tests of their purity, but demand a biological test as well. Bujwid has recently been examining the air and water of the city of Warsaw by the most modern methods. He states that pathogenic micro-organisms are ordinarily found in the air: it therefore follows that disinfection of hospitals and operating-rooms is of no practical value or significance. Certain micro-organisms which may be found in the air Bujwid failed to find during investigations over a period of three years. Of those found in the air non-pathogenic, but one not yet known gives rise to suppuration in mice and rabbits: the rest are innocuous. The number of bacteria in the air is subject to great variations, and depends largely upon the winds and conditions of habitation. After a rain or snow the number is smaller. Basement rooms and abodes contain the largest numbers. On an average, one hundred thousand times more bacteria are found in water than in air. Good water should not contain more than three hundred rod bacteria to the cubic centimetre (0.06 of a cubic inch). Different results were obtained from the examinations of water from various springs and running streams. Above the city the water contained about three hundred bacteria, in the midst of the town over fifty thousand, to the cubic centimetre. Bujwid found no pathogenic micro-organisms whatever. After filtering this same water (sand-filters have recently been introduced into Warsaw), the proportion of bacteria diminished from twenty to sixty. Spring water contains a still larger number of micro-organisms. In the discussion which followed a presentation of these views by Bujwid, Barzyci stated that in a village near the city of Rzeszow, having no spring, a peasant living by the creek was affected with typhoid. His linen was washed in the stream. Shortly many of the inhabitants who obtained their drinking-water from the creek, and who lived below the house in question, likewise sickened with typhoid: all living above escaped.

BALDNESS. — As our readers are already aware from the discussions which have already appeared in *Science*, various theories have been proposed to account for the baldness which prevails to such an extent in civilized countries. A Swiss writer attributes it to a microscopic fungus, which, however, he has not as yet been able to describe or indeed to discover. He thinks that barbers should be compelled to disinfect their combs and brushes.

BOSTON MILK-SUPPLY. — In no city of the United States is the food-supply more carefully watched than in Boston. The inspector of milk of that city has just made his thirtieth annual report, which covers the work performed by him during the year 1888. From this report it appears that 915,867 more gallons of milk were sold in 1888 than in 1887, and, notwithstanding this increase, the quality was much better. In 1883, 60 per cent of the milk examined was found to be below the standard fixed by law. In 1884, only 40 per cent was below; in 1885, 30 per cent; in 1886, 18 per cent; in 1887, 12 per cent; and in 1888, but 8 per cent. The inspector justly claims this great improvement as the result of the labors of his department.

THE MICROBE OF MALARIA. — The evidence is accumulating that the microbe of malaria which was described by Laveran is the cause of intermittent fever. At a recent meeting of the French Academy of Sciences, Professor Bouchard expressed the opinion that Laveran's claim had been substantiated.

BOOKS FROM CIRCULATING LIBRARIES. — Subscribers of public libraries have of late been warned against the danger of contracting contagious diseases from books which have been in houses where these diseases existed at the time. The health authorities of Dresden have been examining the dust which had accumulated on unused volumes, with reference to the discovery of

micro-organisms, and especially the bacillus of tuberculosis. They report that they have found nothing of a harmful character, and have arrived at the conclusion that the danger of spreading infection by means of circulating libraries is very slight. They recommend, however, that books should be well dusted before being read, and that the fingers should not be wet in the mouth in order to turn the leaves. If the experiment is correctly reported, the authorities of Dresden are not justified in deducing any such inferences. The material which may accumulate in the form of dust on "unused books," and that which may collect on books in infected rooms, are of a totally different character. To determine the danger from the use of these latter books, another series of experiments must be made, and, in the present state of our knowledge as to the germs of infectious diseases, not much could be expected even from such experiments. The germs of measles, scarlet-fever, and small-pox, which diseases are known to be propagated by articles of wearing-apparel which have been exposed in infected rooms, have never been recognized, and the search for them in the dust which has collected on books would doubtless be as futile as it has been elsewhere; but there is no *a priori* reason why such books might not be carriers of contagion equally with clothing and furniture. The advice given to dust books well before reading them, in order to avoid danger, is, if the Dresden authorities are correct in saying that such dust is harmless, entirely unnecessary, while, if the dust should be infected, it would be the best possible way to spread the infection. Books which have been in an infected room, especially if they have been opened, should be destroyed. It is practically impossible to disinfect them.

THE LOCO-WEED. — Readers of *Science* have from time to time written us regarding the "loco-weed" and its poisonous properties, and we have recorded every thing which could be learned about its effects on animals and men. In Vol. IX. p. 32, we referred to a curious affection which exists among horses in north-western Texas, known as "grass-staggers," which is caused by eating the "loco-weed," which gives rise to the saying that the horses are "locoed." The Indians believe that an insect is the cause of the disease, but competent investigators have failed to find any insect life upon the plant. In Idaho the same disease is found, and is treated by amputation of the tails of the affected animals (*Science*, ix. p. 306). Francis H. Snow of Lawrence, Kan. (*Science*, ix. p. 92), refers to observations which tend to support the idea that insects are connected with the causation of the disease. Professor Sayre of the University of Kansas was said to be making an exhaustive study of the "loco" problem. Dr. Mary Gage Day of Wichita, Kan., has recently made a number of experiments upon healthy cats to test the toxic qualities of the weed, and has communicated the results to the *New York Medical Journal*. The "loco-weed" is a popular name given to *Astragalus mollissimus* and *Oxytropis Lamberti*. In the experiments of Dr. Day, a decoction of the roots, leaves, and stems of plants gathered in September was used. The result of feeding the decoction to a kitten was to produce diarrhœa, vomiting, convulsions, paralysis, and, at the end of twenty days, death. After death, ulcers were found in the stomach and intestine. In another experiment with a more concentrated decoction, on a full-grown cat, the symptoms were much the same, the cat dying on the thirteenth day. Professor Vaughan of the University of Michigan made experiments on frogs and kittens, injecting the decoction under the skin, producing death. With reference to the character of the plants at different seasons of the year, Dr. Day is convinced, by numerous experiments on material gathered in different months, that the greatest amount of poison is present in the autumn and winter, after the seeds have ripened, and that the explanation of the ranchmen, that the "loco" disease is more prevalent in the autumn and winter because the animals eat more of the weed from the scarcity of other food, is only a partial explanation. The greater toxicity of the plants at that season she believes to be a very important element. From the facts and experiments detailed, the following conclusions are drawn: 1. There is some poison in "loco-weed" which may cause the illness, and, if sufficient quantity is taken, the death, of an animal. 2. This poison is contained in the decoction obtained from the plants, and, by systematically feeding it to healthy cats,

cases of "loco" disease may be produced. 3. From the large quantity of the plant or the decoction required to produce the disease, the poison must be weak, or, if strong, it must be in very small amount.

SCIENTIFIC NEWS IN WASHINGTON.

Effect of Permanent Moisture on Certain Forest-Trees.¹

IN 1874, while engaged in the work of the Kentucky Geological Survey in the lowland district near the Mississippi, I had an opportunity of making some inquiries concerning the knees of the swamp cypress, which led me to the supposition that these peculiar processes from the roots served in some manner to aerate the sap. Their functional importance was indicated by the fact that whenever their summits were covered by water, as by the sinking of the ground on which they stood in the earthquake of 1811, or by the artificial elevation of the water during the summer season in mill-ponds, the trees to which they belonged inevitably died. On the other hand, the trees which grew upon high ground failed to develop any knee processes beyond slight tuberosities on the upper side of their main roots. The results of this and other inquiries were put in press about twelve years ago, but were first published in Vol. XVI. No. 1, of the "Memoirs of the Museum of Comparative Zoölogy at Harvard College," June, 1887. An incidental reference to the fact was made in the third volume of the reports of progress of the Kentucky Geological Survey (1877), p. 74.

Since that time I have incidentally observed certain other phenomena connected with the conditions of our forest-trees in swamps, which, so far as my knowledge goes, have not received adequate attention. I have hoped to find an opportunity to make a more careful inquiry into the subject, but this does not seem possible. I therefore venture to give the results of the very incomplete investigation in this letter.

As it seemed unlikely that the cypress should be the only tree to develop root processes intended to fit the plant for semi-aquatic life, I searched for similar excrescences on the roots of our other forest-trees which find their station in wet lands. Until within a few months, I have been unable to find any other species in which the processes were sufficiently developed to be classed in importance with the cypress knees. A very little inquiry showed me that all trees which find a station in very wet lands have their large roots nearer the surface of the soil than in the upland districts, and several species exhibit a tendency to have their roots at certain points actually on or above the soil. Observations in the Mississippi swamps seem to show that our ordinary tupelo or sour gum (*Nyssa uniflora*, Walt.) exhibited rather more of this tendency than any other species, and I suspected that under favorable circumstances it might show a peculiar adaptation to its swampy surroundings. Observations in the Mississippi valley were difficult, for the reason that the pools beneath which the roots of the trees extend dry out during the summer droughts. Recently, however, in the Dismal Swamp district of Virginia and North Carolina, I found many areas occupied by the tupelo which did not become desiccated in the dry seasons. In all such positions, the tree, when of mature growth, has a peculiar feature in its roots which serves in an admirable way to accomplish the results attained by the cypress knees, though the method by which it is attained is peculiar. In place of forming a spur-like process upon the root, the root itself arches upward in such a manner that the upper part of the bow rises above the level of the water in the growing season. Where the depth of water is slight, the arch may be indistinctly developed. Where the water stands a foot or more in depth, the arch becomes very much elevated. I found specimens in which the roots assumed a horseshoe-like curve, rising to the altitude of three feet above the soil, the distance apart of the roots at their base not exceeding a foot. These roots commonly have a diameter of from three to six inches. The fact that they rise above the level of the water in the growing season is often attested by a considerable growth of annual plants which have become planted in the crevices of the bark.

These roots of the *Nyssa* do not appear to develop their arches until the tree attains a considerable size. I found no trace of them

¹ Preliminary notice of some results of the United States Geological Survey examination of swamp-lands, by N. S. Shaler.

in the cases where the plant was less than one foot in diameter at the ground, and they do not become a conspicuous feature until the tree is nearly adult; i.e., until it has attained a diameter of eighteen inches or more. At this stage of growth, if the crown be permanently wet, the knees become an extremely conspicuous feature, fifteen or twenty often being found grouped about a single stem at the distance of from five to twenty feet from the base of the bole. It thus appears tolerably certain that the need of having a portion of the roots above the water-level will be found in certain other trees. Thus far my note-books supply me, however, no certain indications of this fact. Indeed, it is only in the case of *Taxodium* and the tupelo that I have found the plants under circumstances which would show clearly their needs in this respect.

There is another feature concerning the growth of water-loving trees, or at least those which are tolerant of permanent moisture, that deserves attention. I have reference to the form of the bole or trunk as it is exhibited in the specimens of the Southern species, which occupy situations diversely affected by moisture. On very wet ground the trunk appears to be generally expanded at the crown, in a measure, which is not the case in specimens of the same species growing in dryer situations. Thus, in the cypress, we not infrequently find the bole at the crown, and for some feet above, having a diameter twice as great as it is at ten feet above the surface. Where, however, the tree grows on a dryer soil, the expansion at the base is much less considerable. The same appears to be the case in the tupelo, which often has a remarkable expansion of the trunk near the surface of the ground, where the plant occupies very wet situations. In a somewhat less degree, this feature appears to exist in all our trees, except the willows, which occupy sites characterized by diversity in the measure of wetness. I should state that this opinion rests entirely on eye-measurements. I have long intended to submit the impression to the criticism of a careful determination, but have not been enabled to do so. The impression has, however, been so often repeated to me in different regions, that I am inclined to believe there is little chance of error in the statement. I trust that some one who is well placed for such observations will subject the suggestion to a careful statistical inquiry.

If I be correct in the opinion that trees in very wet situations develop an enlarged bole near the surface of the ground more frequently than those which occupy dryer situations, we may perhaps account for the fact in the same way in which I am disposed to explain the occurrence of knees in *Taxodium* and of root-loops in the tupelo; viz., through a need of an aeration of the sap, which is denied in roots that are under water.

It appears to me from eye-observation, as yet uncorrected by measurements, that the buttresses which the water-loving trees form about the trunk are more considerable than they are in the same species on higher land. If this be really the case, it may perhaps be due to the same physiological need which has led to the formation of knees, and to the enlargement of the bole near the crown of the tree. I feel less confident as to this increase in the buttress prominences than I do concerning another observation which I have above set forth. I state the impression for the reason that it has very frequently been borne in upon me in my studies on the development of swamp-plants. At first I was disposed to attribute the peculiarity to the fact that the roots of swamp-trees do not usually extend far beneath the surface, and therefore the buttresses were enlarged in order to give greater stability to the trunk. This hypothesis was disproved by the fact that trees growing in such situations are very rarely uprooted by storms. I failed, indeed, to find a single case of such uprooting by the action of the wind in several thousand miles of journeys through the morasses in the eastern part of the United States. The only cases in which such overturning met my eye appeared in the swamps near the Mississippi, which, on the whole, exhibit buttress structures much less conspicuously than the trees of the Atlantic coast morasses.

There is another interesting series of facts connected with the effect of excessive water on our forest-trees which are tolerant of swamp conditions. These relate to the variations in the character of the bark, the mode of branching, etc., of the plants in situations diversely conditioned as regards the amount of moisture. In almost all our forest-trees, which range from dry to very wet stations,

there are noticeable diversities as regards the above-mentioned features, according to the station they occupy. Thus the ordinary chestnut oak varies in a very noticeable manner between dry ground and wet. The tree in very wet situations has a much smoother bark than it exhibits on high land, and I am told by the woodmen that this bark in trees which grow within the swamp is unfit for the purposes of tanning. The variety of tupelo known to the woodman of the Dismal Swamp as the "pawpaw gum," appears to owe its peculiarities to the fact that it normally grows in much wetter localities than the ordinary *Nyssa*. It differs from the parent species in that the bole is singularly enlarged near the crown, often having a diameter for some feet above the surface of the water two and one half times as great as it has at the height of ten feet above the ground. In this connection it may be noted that this variety of the tupelo is less disposed to develop the root-loops than the more common form, it appearing indeed as if the great extension of the bole near the crown made the development of these processes unnecessary.

The variation in the character of our forest-trees when exposed to swamp conditions affords an extremely interesting field for an important class of inquiries concerning the influence of environment, and the effect of natural selection, on the development of organic forms. In the Dismal Swamp, where the water-level during the growing season is subject to relatively little variation, a difference in altitude of six inches, or at most a foot, will greatly affect the character of the timber-trees and other plants. With each such variation in height, we perceive a noteworthy change in the character of the vegetation.

MENTAL SCIENCE.

Statistics of Visual Images.

THE American Society for Psychical Research has devoted considerable time to the study of unconscious mental habits, — a field that abounds in suggestions applicable to the class of phenomena which such a society investigates, but is still more valuable as contributing to our knowledge of obscure mental traits. Thus Professor C. S. Minot has shown that we are by no means as likely to think of one number as of any other, when simply asked to think of a number, but that there exist certain definite and very general preferences for certain numbers above others. People have "number-habits," or unconscious tendencies to choose a certain few numbers (perhaps on account of greater familiarity, easy manipulation, peculiar association, brevity of utterance, or other causes) when an unlimited choice is offered them. In No. 4 of the "Proceedings of the American Society for Psychical Research," Professor Minot brings together extremely interesting material for a similar study with reference to the "diagram-habit." The committee on experimental psychology of this society sent out a large number of postal-cards bearing the printed request, "Please draw ten diagrams on this card, without receiving any suggestion from any other person, and add your name and address." Five hundred and one such cards have been collected, of which 310 were drawn by men, 169 by women, and 22 had no name.

The first point of interest in such a study is to observe how various the drawings of five hundred persons will be. We are not told how many different designs occurred; but the occurrences of 83 different designs have been tabulated, and their sum includes about half of all the drawings. But the real poverty of the intellect when it expresses itself naturally is made evident by the great preponderance of a very few simple diagrams. Thus circles were drawn 209 times; squares, 174 times; equilateral triangles, 160 times; crosses, 160 times; letters of the alphabet, 82 times; diamonds, 80 times; oblongs (horizontal), 78 times; inscribed circles, 78 times; stars, 77 times; faces (profile to the left), 61 times; houses, 56 times; rhombi, 56 times; scrawls, 53 times; other animals and heads, 48 times; flowers, 46 times; leaves, 45 times; hexagons, 42 times; cubes, 42 times; right-angled triangles, 42 times; figures of men, 32 times; and so on. The above are the twenty most frequent drawings, and, it will be seen, form an aggregate amounting to nearly one-third of all the drawings. On the average, each occurs 80 times. If we group to-

gether the designs belonging to the same natural class, we find, of circles, both plain and with inscribed figures, 287; of squares, both plain and with inscribed figures, 236; of triangles, equilateral and otherwise, 220; of four-sided figures, 245; the sum of which four classes is 988, or nearly one-fifth of all the drawings. In other words, if a person is about to draw the first ten designs that come to his mind, it is a pretty safe prediction that two of the ten will be either a circle, a square, a triangle, or a quadrilateral.

Tabulation upon another basis reveals the fact that 2,344 diagrams were drawn exclusively with straight lines, and 1,337 diagrams with less than six straight lines; that 681 diagrams were drawn exclusively with simple curved lines, and 603 diagrams with less than six such lines. One is more than three times as apt to draw a diagram composed of straight lines than one composed of curved lines. Among the non-geometrical designs, animals, plants, and manufactured objects include by far the most frequent drawings. Men are drawn 32 times; hands, 10 times; flowers, 46 times; leaves, 45 times; and trees follow with only 14 times; houses are drawn 56 times; and the next figure under this class is 15 for books.

Furthermore, without any express implication in the request, the respondents have taken it for granted that ten different designs were wanted, and very few repetitions of designs occur. If the number of persons drawing each kind of design be tabulated, it reinforces the conclusion suggested by the original tabulation as to the limitations of the mind when acting as it does in these tests. 40 per cent of the respondents have drawn circles; 34 per cent, squares; 31 per cent, equilateral triangles; 25 per cent, crosses; 16 per cent, diamonds, etc.; and there are very few designs drawn by only one person.

What this research especially impresses is the lack of individuality in our off-hand mental products. As Dr. Minot well puts it, "We too easily forget our similarity, and forget that it stretches over trifling habits as well as over the great and little modes of thought. We feel, and for the most part willingly acknowledge, the likeness of our natures, but our sentiments and ideas we are over-inclined to consider original. Such tests as the drawing of the diagrams thrust home the conviction that even in trifles we differ very little. The images and notions which pass across the consciousness of each individual are almost all common property: they are comparable to coins, — every one is a separate entity, but yet the stamp is the same. Our thoughts are in a large measure owned by the community: we are in mental matters all pure communists."

There are other questions upon which these results shed interesting light. The first is the order in which one is apt to draw, and by inference to think of, the several designs. One would suppose that the designs occurring most frequently would also be the ones first thought of. The results, however, do not reveal as close an agreement as one would expect. They show that an equilateral triangle is more apt to be found among the first diagrams than any other figure. Then come squares, then right-angled triangles, then circles, then faces not in profile, then faces with profile to the right, then diamonds, then oblongs, and so on. It is possible that the order of frequency of diagrams occurring the very first of the ten would be more in agreement with the order of general frequency. Another interesting comparison is between the designs furnished by the men and by the women. Remembering that we have nearly twice as many records of the former as of the latter, we find that men have more than their share of circles, both plain and inscribed, of rhombi, of scrawls, of men, and of right-angled triangles, while women are fonder of squares, equilateral triangles, letters, diamonds, stars, faces, flowers, and so on. "That gentlemen preponderate with hearts, and ladies with hands, perhaps may seem to many a natural consequence of our social conditions;" and other of the preferences seem to have a natural basis. That many of them must be regarded as accidental is doubtless to be admitted. The general law, however, is that there is much more repetition, and thus much less variety, among women than among men.

A few residual points should be noted. Some of these designs are undoubtedly to be traced to the existence of a "form" in the mind towards which a person may persistently tend. The "num-

ber forms" so vividly described by Mr. Francis Galton may serve as a type of such habits. When toying with a pencil in one's hand, many persons will find themselves drawing over and over again a simple figure. This accounts for some of the very peculiar drawings furnished by some of the respondents, and testimony in favor of such "forms" could easily be gathered. The individual bent, the dominant interest, the "apperception," as the psychologist would term it, serves as another clew. "A painter recalls his palette; a naturalist, his butterfly; a physician, his skull; a college student, his bicycle; in a few cases the entire ten drawings seem to be taken from "professional" suggestions. Another class of drawings seem to have their origin in the surrounding objects, being really copies of objects seen at the time; but this is a small class, and most of the images are doubtless drawn from the resources of past experience. Finally, the drawings are almost all simple in character. We draw what is easiest. This is well shown in the prevalence of faces seen in profile to the left, of left-handed spirals, and so on: for these are easier to draw, and the corresponding designs inverted towards the right; that is, easier for right-handed persons. So that these predominances indicate at once the general right-handedness of mankind, and the tendency to draw what is easiest.

The practical application of these facts tells severely against the arguments supported by the English Society for Psychical Research in favor of thought-transference. Dr. Minot points out that in several series of experiments reported in their "Proceedings" the position has been assumed that one kind of card, of number, of simple figure, is as likely to be thought of as another, and has estimated the improbability of the recorded coincidences accordingly. All evidence in which such an assumption is used must be looked upon with suspicion; and only when the conditions of the experiments take full and complete account of this very universal tendency for minds to run in similar grooves when dealing with simple things, will it be time to consider the evidence in favor of any abnormal form of the communication of ideas.

COMMERCIAL GEOGRAPHY.

An Agricultural Map of North America.¹

THE climatic conditions of North America are favorable to agriculture, except in the arid regions and in the extreme north. By the uncultivable region the agricultural land is divided into two parts of unequal extent, — the narrow Pacific coast strip, and the Atlantic region. East of the Rocky Mountains three zones of agriculture may be distinguished. The most southern one is that of subtropical cultures, reaching to the 37th degree of latitude; the central one is that of the culture of corn; and in the most northern zone wheat and oats are the principal products. On the Pacific coast there is no zone of subtropical cultures, but two zones only can be distinguished, — that of wheat, and that of oats. This fact shows that there is a marked difference between the Pacific and Atlantic regions. Two-thirds of the latter are used for the culture of subtropical plants, to which class corn belongs, while these are nowhere cultivated on the Pacific slope. This contrast is caused by the difference of climate, that of the wheat districts of California and Oregon being characterized by a uniform oceanic climate, with prevailing precipitations in winter, and dry summers; while the cotton and corn regions of the Atlantic side have a continental climate, with abundant precipitation during the warm seasons. Only the oats regions on the Pacific and Atlantic sides are analogous, the climate being characterized by a low temperature of summer and sufficient precipitation.

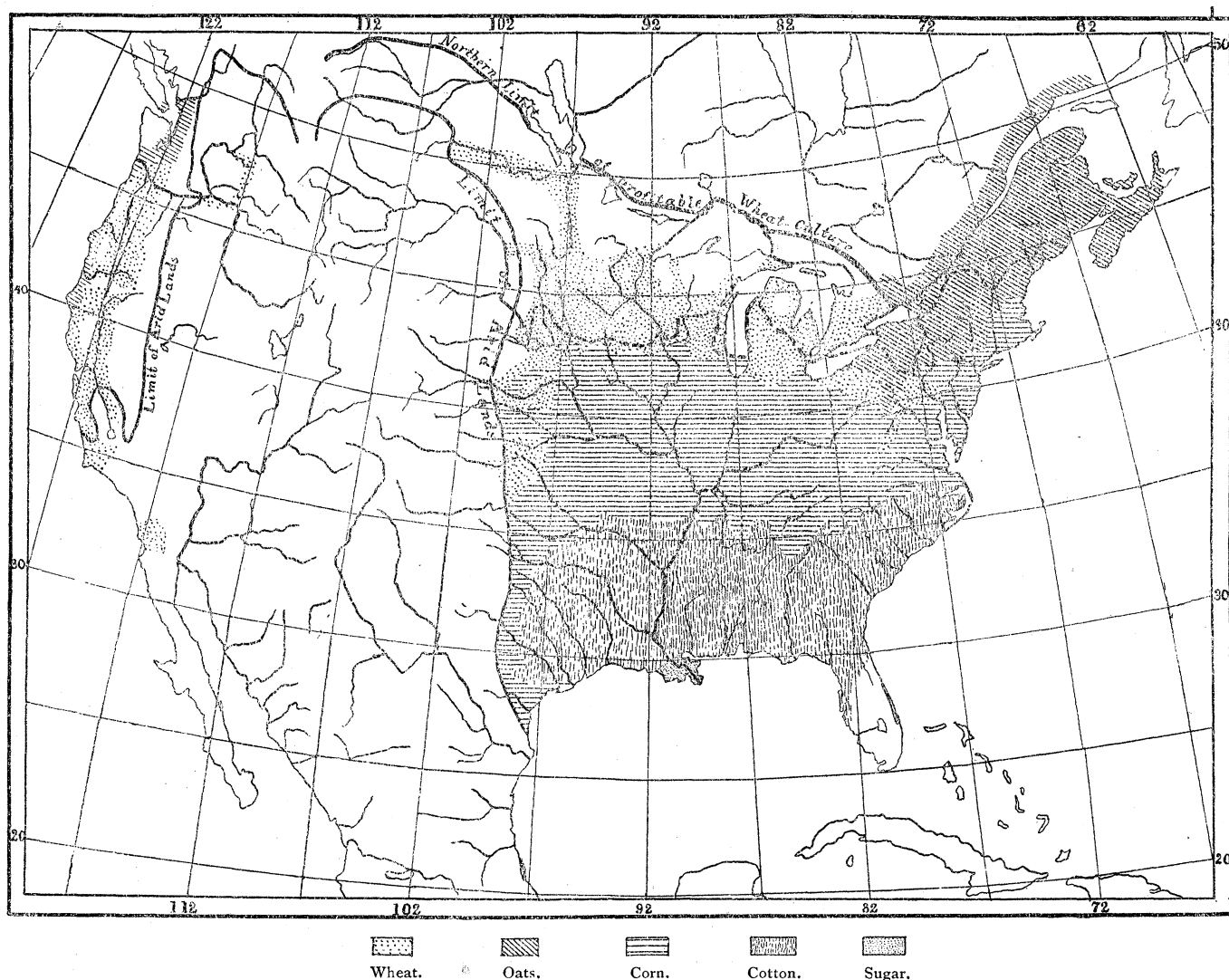
While the dampness and heat of the Atlantic summer favor the cultivation of subtropical plants more than in any other country, the sharp contrasts of summer and winter prevent the successful cultivation of plants of the southern temperate zones, especially that of the vine, oranges, and lemons, which require a spring with slowly rising temperature and moderate precipitation.

On the accompanying map the extent of each culture has been laid down according to the results of the tenth census, the percentage of area of land occupied by each culture being inserted in a large-scale map, of which the present sketch-map is a reduction.

¹ According to Max Sering, *Die landwirthschaftliche Konkurrenz Nordamerikas*.

The area of cotton-culture has attained its present limits only after many attempts to introduce it still farther north, where early frosts prevent its being successfully carried on. At present the northern limit of cotton-culture approximately coincides with a mean January temperature of from 36° to 39° F. Even in the southern districts of cotton-cultivation, it is greatly influenced by the excessiveness of climate. While in the south of Spain the cotton-plant is a perennial, it is killed in the United States every winter by frost, and the plantations have to be renewed year by year. But the American plant exceeds, in amount and quality of its product, that of countries where the climate is more favorable to its growth. Besides cotton, corn is grown to a considerable ex-

We turn to considering the second zone of the Atlantic region, that of corn. In North America corn-culture extends farther north than in any other part of the earth. In more than two-thirds of the eastern part of the United States it is the principal cereal product. Its growth is favored by the heat and the suddenness of precipitation in summer, the sky being generally clear, while rain comes down during brief thunder-storms. The northern and western limit of corn-culture is not determined by the decrease of summer temperature and of precipitation, but by the increasing frequency of early frosts in the fall, and late frosts in the spring. In the valley of the Mississippi, corn ceases to be the most important culture under the $43\frac{1}{2}$ degree of latitude, where the mean tem-



AGRICULTURAL MAP OF THE UNITED STATES AND CANADA.

tent; but everywhere the former is the central point of interest to the farmer, more money and labor being invested in cotton-plantations than in any other culture. It is a remarkable fact, that corn, although the climate is well adapted to its growth, does not give nearly as good and rich harvests as farther north, where the climate is not so well adapted to its growth. The same is true regarding wheat, which gives the greatest and best returns near the northern limit of its possible cultivation. In the cotton region, wheat, barley, and rye are cultivated only in dry districts, in the higher parts of the Alleghanies, and in the semi-arid region of western Texas.

Sugar-cane is not cultivated very extensively, as the cold of winter hurts the young plants. It is only in the delta of the Mississippi that it is the prevailing culture, and in the adjoining parts of Louisiana it reaches a considerable extent.

perature of July amounts to $72^{\circ}.5$ F. In eastern Ohio and Pennsylvania it hardly reaches the 40th degree of latitude, and in the mountains of Virginia it does not extend beyond the 37th degree of latitude; while on the coast, where there are no late frosts, it rises to the 44th degree of latitude. North of this line, early varieties of corn are still cultivated, their northern limit being indicated on our map by a broken line. North of this line oats take the place of corn. In the West the corn region does not extend nearly as far north as in the East, on account of the greater frequency of late frosts, which the young plant is unable to withstand. The irregularity of the western limit is not caused by climatic differences, but by the recent settlement of the districts.

In this region wheat is cultivated extensively, but it is everywhere second in importance to corn. In the humid, warm regions of Delaware, in Tennessee, Kentucky, Missouri, Illinois, about three-

fifths of the whole region is used for corn-culture, while the northern and western limit covers those districts in which not more than one-half of the improved lands is used for this cereal. On the whole, the climate of the corn zone is not favorable to wheat, as the summers are too hot, and have too much rain. Notwithstanding this fact, the great centre of American wheat-production is situated in this region, south of the Great Lakes. It is remarkable, that, notwithstanding the great total amount of precipitation, excessive dryness in any part of the period of growth of the plant causes poor crops, long periods of clear weather being interrupted by sudden violent showers of rain. Besides this, the rapid increase of temperature in spring is not favorable to the development of wheat.

The northern zone is divided into two sections, — that of wheat, and that of oats. An important line in this region is the southern limit of summer wheat, as those countries in which only summer wheat can be grown have serious disadvantages as compared to others. As all the sowing has to be done in spring, the amount of work at this season is so great as to make the introduction of the most profitable methods of culture impossible. Owing to the severity of our winters, this line runs far more southerly than in Europe. Starting from Boston, it crosses Massachusetts, northern New York, and Ontario. It reaches the 45th parallel in Michigan, and in the prairie region descends to 38° and 39° north latitude. North of this line, only summer wheat can be grown. This region includes almost the whole arable prairie region, and the whole Dominion of Canada with the sole exception of southern Ontario. In the eastern portion this line coincides with a temperature in January of 18° F., while in the western part of the country it coincides with that of 30° F. This difference is principally founded on the difference of snowfall in those regions. While the Eastern States are covered with deep snow, the prairies have no such protection, and the dry, cold winds of winter kill the young plants.

One of the most remarkable features of the wheat area is its great extent northward in the central parts of our continent, where a clear summer favors its cultivation. The same climatic peculiarity accounts for the existence of the Genesee wheat region of central New York. Wherever the amount of precipitation in summer exceeds 50 centimetres, oats are cultivated in preference to wheat.

Finally we have to consider the Pacific coast strip. In the large valleys of California and Oregon the summers are warm, but not moist enough for the extensive cultivation of corn and cotton; while farther north the precipitation is sufficient, but the temperature too low. It is true that in a few districts of California, and also in Oregon and Washington Territory, corn is the third in importance among the cereal products; but, taken as a whole, only three per cent of the total area is applied to its cultivation. In southern California excellent crops of corn are obtained by means of irrigation.

In California and Oregon, and in that part of Washington Territory situated east of the Cascade Range, the culture of wheat is by far the most important. In California and Oregon seventy per cent of the cultivated area is used for growing wheat, a figure which is equalled only in Minnesota. The clear and dry summer favors wheat more than any other plant, a sufficient amount of humidity being retained in the ground after heavy winter rains. In southern California the cultivation of wheat requires irrigation. Second in importance is barley, which in California occupies twenty-three per cent of the cultivated area; farther north the rainfall increases, and oats take the place of barley; and still farther north barley-culture is more important than even that of wheat.

Taken as a whole, about one-half of the continent of North America is arable land, about thirty per cent belonging to the polar regions, while twenty per cent is arid land, or mountainous, rocky regions. The agricultural region includes one of the countries best adapted to the production of cotton and corn, while the climate of the same region excludes other cereals and the vine. The development of the wheat region, although very rapid, is hampered by numerous disadvantages, — severe winters, rapid increase of temperature in spring, sudden variations of temperature, late frosts in spring and early frosts in the fall, and frequent draughts impair its value, while the dryness of the early fall favors the culture. On the whole, the climate is not as favorable to the growth of wheat as that of Europe. If, notwithstanding this fact, the wheat-pro-

duction of the North-west has reached the enormous importance it has actually attained, the reason must be looked for in economic more than in agricultural considerations. The rapid colonization of the prairie regions, their easy cultivation, and the great natural highways of our continent, have given it the importance it possesses at present. But it would be erroneous to believe that this development will continue, that the amount of wheat produced and exported will indefinitely increase. When the tillable land has been taken up, and no new areas of productive land are added to the old ones, the economic reasons which have made the North-west the great granary of the world will cease, and the development will take another course, yielding greater returns from the same area than are possibly attained by the present wheat-culture.

NOTES AND NEWS.

THE director of the United States Mint, in his annual report to Congress, says that the gold product of this country for the year 1888, was 1,644,927 ounces, of the value of \$33,175,000. This is about the same as in 1887, being an excess of only \$175,000. The silver product was 45,783,632 fine ounces, of the commercial value of about \$43,000,000, and of the coining value of \$59,195,000. This is an increase of 4,515,327 fine ounces over the product of 1887. In addition to the product of our own mines, some 10,000,000 ounces of silver were extracted in the United States from foreign ores and bullion, principally Mexican. The coinage of the mints during the year was as follows: gold, \$31,380,808; silver dollars, \$31,990,833; subsidiary silver, \$1,034,773; minor, \$912,201; total, \$65,318,615. The import of gold bullion and coin was \$11,031,941, and the export \$34,619,667, a loss by export of \$23,587,726. The import of silver was \$21,592,062, and the export \$29,895,222, a loss by export of \$8,303,160. The metallic stock of the United States Jan. 1, 1889, including bullion in the mints awaiting coinage, is estimated to have been, gold, \$705,061,975; silver, \$403,516,756; total, \$1,108,578,731.

— Dr. Chaillé, the well-known statistician, states that the average life of woman is longer than that of man, and in most parts of the United States woman's expectation of life is greater.

— A correspondent of the *New Orleans Medical and Surgical Reporter* says that petroleum-oil is almost universally used by the artisan and poorer classes in London as an illuminant, and the number of accidents which occur yearly with these lamps is very large. Mr. R. W. Brownhill has invented an ingenious prepayment gas-meter, based on the principle of the cigar, coffee, and other automatic supply-stands to be seen in every railway-station in London. It consists of a small attachment, which can be applied to any meter, and which will cause the gas to be delivered in definite quantities as paid for by pence dropped into a box. All that has to be done is to drop in a penny and pull a small handle, when sufficient gas for the supply of an ordinary burner for six hours will be delivered from the meter. Any number of pennies may be placed in the box, one at a time, up to 143, the handle being pulled after each penny, which would insure 858 hours' gas to one burner, or a shorter supply to several.

— Carl Zeiss, whose fame as a manufacturer of microscopes and microscopical lenses is world-wide, has just died at Jena, at the age of seventy-three.

— A flume fifty miles in length has just been completed at San Diego, Cal. It is intended for irrigation purposes and water-supply. The reservoir in the mountains, whence the water is supplied, is 4,500 feet above sea-level.

— Dr. O. J. Broch, at one time professor of mathematics at Christiania, and later minister of the Board of Trade in Norway, who more recently acted as director of the International Bureau of Weights and Measures at Paris, died at Sèvres, Feb. 5, at the age of seventy-one. It has been the especial duty of the bureau, over which Dr. Broch presided from its creation after the Metric Convention of 1875, to construct new standards of the metre and kilogram for the different countries which were parties to that convention. At the time of his death all these standards had been constructed, and were only awaiting final approval at Sèvres before their delivery this year to the several contracting States.

— Agassiz Association, Chapter 949, New York City (Z), held its third annual exhibition of natural history collections, microscopes, electrical apparatus, etc., on Saturday, March 2, 1889, at 49 West 20th Street, near Sixth Avenue, from 3 to 6 P.M., and from 7 to 10 P.M.

— The ship-canal which is to connect Manchester, England, with Liverpool, is being rapidly constructed, ten thousand men and a great number of steam excavators being engaged upon it. The canal will be thirty-five miles long, twenty-six feet deep, and a hundred and twenty feet wide at the bottom.

— Rev. Arthur C. Wagborne, New Harbor, Newfoundland, has published "A Summary Account of the Wild Berries and other Edible Fruits of Newfoundland and Labrador."

— The exercises of the centennial celebration of Georgetown University, Washington, D.C., closed, Feb. 22, with a session in Gaston Hall, at which the honorary degrees were conferred by President Cleveland. Three gold medals were struck in honor of the occasion, which were awarded as follows: one to John Gilmary Shea, LL.D., the historian of the Catholic Church in America, for his work, "The Life and Times of Archbishop Carroll;" a gold medal, struck by the Alumni Association, presented to his Eminence James Cardinal Gibbons, for the archi-episcopal see of Baltimore; and a gold medal, like the preceding, to the President, Grover Cleveland, for the Government of the United States.

— A meeting was held, Jan. 31, in the meeting-room of the Royal Society, London, the Right Hon. Lord Rayleigh, Sec.R.S., in the chair, for the purpose of promoting a project, set afoot by some of the leading men in Munich, of erecting in that city a statue of George Simon Ohm, — a man who, although he discovered no new phenomena of very striking importance, yet by the accuracy of his thought, and the clearness of his insight into the true bearings of physical facts, was able to lay one of the principal and firmest parts of the foundation of modern physics. The occasion for the proposal at this particular time is the near approach of the hundredth anniversary of Ohm's birth, on March 16, 1789.

— The fourteenth annual commencement of the American Veterinary College was held at Chickering Hall, New York, Monday evening, March 4.

— At the meeting of the Royal Meteorological Society, Feb. 20, a report on the helm-wind inquiry was made by Mr. W. Marriott, F.R. Met. Soc. The helm wind is peculiar to the Cross Fell range of mountains in Cumberland, which runs from north-north-west to south-south-east. This range is high and continuous, and is not cut through by any valley. Cross Fell is 2,900 feet above sea-level. From the top of the mountains to the plain on the west, there is an abrupt fall of from 1,000 to 1,500 feet in about a mile and a half. At times, when the wind is from some easterly point, the helm forms over this district, the chief features of the phenomenon being the following: a heavy bank of cloud rests along the Cross Fell range, at times reaching some distance down the western slopes, and at others hovering just above the summit, while at a distance of two or three miles from the foot of the fell a slender roll of dark cloud appears in mid-air, and parallel with the helm cloud: this is the helm bar. The space between the helm cloud and the bar is usually quite clear, while to the westward the sky is at times completely covered with cloud. The bar does not appear to extend farther west than about the river Eden. A cold wind rushes down the sides of the fell, and blows violently till it reaches a spot nearly underneath the helm bar, when it suddenly ceases. The observations that have been made in the district during the past three or four years show that the helm wind is not such a rare occurrence as it was popularly supposed to be, the bar having been observed on 41 occasions in 1885, 60 in 1886, and 19 in 1887. The phenomenon takes place usually when the sky to the eastward is covered with cloud.

— Two large hydraulic canal-lifts have been recently erected at Fontinettes, on the Neufossé Canal, in France, and at La Louvière, on the new Central Canal, in Belgium. They both consist of two counterbalancing troughs, resting on central hydraulic rams, 6 feet 6½ inches in diameter, and moved by an excess of water introduced into the upper trough, and by hydraulic machinery supply-

ing water to the presses under the rams to aid the ascent. The troughs at Fontinettes are each 129 feet 7 inches long, 18 feet 4½ inches broad, and contain 6 feet 6½ inches depth of water, so as to be available for vessels of 250 tons. The troughs at La Louvière are 141 feet long, 19 feet wide, and hold water to a depth of 10½ feet, being designed to admit vessels of 400 tons. The total weight they lift is 785 tons at Fontinettes, and 1,037 tons at La Louvière, while the heights of the lifts are 43 feet and 50½ feet respectively.

— Professor Baker of the Illinois University says in a letter to the *Clay Work* on the sustaining strength of brick-work, "By actual experiments in a testing-machine, the average strength, from fifteen experiments, of piers laid in ordinary brick and common lime mortar, using the same care as that with which ordinary brick masonry is built, stood a few pounds (I am writing from memory) over 1,500 pounds per square inch, which is equal to 216,000 pounds per square foot, or the weight of a column of brick 2,000 feet high; with ordinary Portland cement mortar, the strength was, for a mean of eight experiments, 2,500 and some odd pounds per square inch, which is equal to 360,000 pounds per square foot, or the weight of a column of brick masonry 3,600 feet high."

— The naval board charged with the duty of supervising and reporting upon the test of the 15-inch pneumatic gun last January have just made their official report to the secretary of the navy, who pronounces it satisfactory. The report is to the effect that more than one-half the projectiles, fired at ranges of 300, 1,700, and 2,100 yards, fell within the specified target limits, an area of fifty by a hundred and fifty feet.

— The annual address of the president of the New York Microscopical Society, Charles F. Cox, read Jan. 4, 1889, was on "The Spontaneous Generation Theory, and its Relation to the General Theory of Evolution." The close of the address was as follows: "In the domain in which Mr. Darwin worked, I look upon natural selection as a well-established principle. In the developmental idea as extended and expounded by Herbert Spencer, I find much that appeals strongly to my sense of fitness and consistency, and, if possible, I could see the hypothesis become a proven law of nature without a shock to my mental or moral status. I have no fear of any thing that is true. But what I have endeavored to show is, (1) that a transition from not-living matter to living forms is an essential step in the process of evolution; (2) that at the point at which experimental proof is applicable (namely, to present and continual archebiosis), the theory of such a transition is discredited, if not disproved; (3) that scientists generally accept this conclusion, and that those who are not thorough evolutionists are confined to the mere belief that the step from the not-living to the living was taken at some remotely early period, beyond the reach of evidence. And finally, I submit, as a consequence of these premises, that the general theory of evolution is still in the stage of hypothesis, and that in the gap between lifeless substances and living forms we have the veritable 'missing link.'"

— Thanks to strict preservation, and to the fact that the inhabitants are realizing the value of the bird, according to *Nature*, the eider has greatly increased in number in Iceland during recent years. The people do all in their power to attract the bird to their property. Among these attractions are bells worked by the wind or by water, the hanging-up of dress material of a glaring color, and the keeping of brightly colored fowls. A society has been formed for the granting of premiums for the killing of animals preying upon the eider, and last year 1,155 such prizes were awarded.

— In a late number of *L'Architecture*, M. Edmond Pottier contributes a letter on antique polychromy, combating the idea that a Greek temple was an edifice painted in every part, from the steps to the cornice, which appears to be entertained by some French archæologists. He observes that no monument, except the temple at Ægina, offers traces of color on the shafts of the columns, and that a comparison cannot be instituted between that case and such a building as the Parthenon, inasmuch as the latter was in marble and the former in porous stone, to which it might have been thought desirable to give a surface finish of paint, without implying that the same treatment would be applied to marble.

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THE NEW YORK MINERALOGICAL CLUB is a society organized in 1887 for the purpose of studying the rocks and minerals of the city and vicinity, which present many interesting and remarkable features. Very few persons have any idea of the number and variety of minerals that are found in the rocks of Manhattan Island and the immediate suburbs. But in some respects this locality is peculiar, for the reason that while a large amount of excavation and rock-cutting is all the time going on, yet scarcely is a deposit of minerals discovered in the progress of any such work, ere it is built over or filled up, and rendered forever inaccessible. New York Island specimens, therefore, possess in this aspect unusual interest, and the collection and preservation of them become a matter not only of scientific value, but of local pride. During a number of years past, a gentleman well known, and greatly respected in cultured circles here, Mr. Benjamin B. Chamberlin, has devoted a great amount of time, labor, and care to gathering these specimens from all parts of the city, wherever excavations were in progress. At the time of his death, in October last, he had thus secured the finest cabinet of New York minerals ever obtained. Mr. Chamberlin was not a man of wealth, and labored in this field out of pure love for science. The New York Mineralogical Club is very desirous to obtain this collection by purchase, that it may be retained in the city in its entirety, and serve as the foundation of

a permanent local collection, which, for the reasons above given, must ever increase in value and interest as time goes on and the city is more and more built up. The moderate sum of fifteen hundred dollars will secure this very desirable object; and the trustees of the American Museum of Natural History have agreed to receive the collection on permanent deposit in their absolutely fire-proof building, where it will always be accessible for purposes of study, — a monument to the zeal and success of its honored collector, and a matter of interest and credit to the metropolis.

SCIENCE IN THE SCHOOLS.

THE committee on the subject of science in the schools, of the American Society of Naturalists, consisting of Samuel F. Clarke (Williams College), William North Rice (Wesleyan University), William G. Farlow (Harvard University), George Macloskie (College of New Jersey, Princeton), and C. O. Whitman (editor *Journal of Morphology*), have made a report which has been accepted and heartily approved by the society. The committee have been retained, and have been granted full power to act for and with the society in the endeavor to establish what they have recommended.

From the steadily increasing demand of scholars, parents, and teachers for more and better instruction in these departments, the committee feel assured that the time is ripe for this movement, and that it only needs intelligent and concerted action to produce the results desired. The society will be represented at the meetings of the various educational associations in the country, and will make every effort to push the movement as vigorously as possible. It needs, however, and asks for, the active support and encouragement of every parent and teacher who believes that the young should have their natural tendencies, and longings for a knowledge of the things of nature, cultivated; their questions about things which are in every way pure and true answered; opportunities for enjoyment, and for friendships that will never fail, laid open to them; and, above all, the opportunity freely afforded them for securing the brain-growth and mental power, by observation and independent thought, which these studies are so peculiarly well fitted to give.

In regard to the general topic of science-teaching in the schools, the committee believe the following propositions fairly formulate the views which are held by the members of the society, and which the society should use its influence to diffuse:—

1. Instruction in natural science should commence in the lowest grades of the primary schools, and should continue throughout the curriculum.

2. In the lower grades the instruction should be chiefly by means of object-lessons; and the aim should be to awaken and guide the curiosity of the child in regard to natural phenomena rather than to present systematized bodies of fact and doctrine.

3. More systematic instruction in the natural sciences should be given in the high schools.

4. While the sciences can be more extensively pursued in the English course in the high schools than is practicable in the classical course, it is indispensable for a symmetrical education that a reasonable amount of time should be devoted to natural science, during the four years of the high-school course, by students preparing for college.

5. An elementary (but genuine and practical) acquaintance with some one or more departments of natural science should be required for admission to college.

Believing that the propositions stated above will command general acceptance, they are aware that there must be difference of opinion, among the members of the society and among intelligent educators in general, in regard to details, and that the precise subjects to be introduced into the curriculum must vary somewhat with the circumstances of different localities. They offer the following, not as necessarily the best scheme, but as a reasonable and practical scheme, which may at least serve to illustrate the general principles which they have formulated.

In the primary schools, and in the lower grades of the grammar schools, they recommend that the study of plants and animals should be the main part of the scientific work. The botanical

instruction should commence with such simple exercises as drawing and describing different forms of leaves, and should gradually advance to the easier and more conspicuous flowers, and later to the more obscure and difficult forms of flowers, the fruits and seeds.

The zoological instruction in the lower schools should not attempt a systematic survey of the whole animal kingdom, but attention should be directed chiefly to the most familiar animals, and to those which the pupils can see alive. The common domesticated mammals should first be studied, and later the birds, the lower vertebrates, the insects, crustacea, and mollusks. While the range of zoological instruction must be limited as regards the number of forms studied, those few familiar forms should be so compared with each other as to give the pupils, very early, some conception of the main lines of biological study, — morphology, physiology, taxonomy.

Special prominence should be given to the study of plants and animals which are useful to man in any way; and the teacher may advantageously, from time to time, give familiar talks in regard to useful products of vegetable and animal origin, and the processes of their manufacture.

Attention should also be given to the more obvious characteristics of the kinds of minerals and rocks common in the region in which any school is situated, and to such geological phenomena as are comparatively simple and easily observed.

A most important feature of the scientific instruction in the lower grades should be to encourage the pupils to collect specimens of all sorts of natural objects, and to make those specimens the subject of object-lessons. The curiosity of the children will thereby be rationally cultivated and guided.

The subject of human physiology and hygiene is of so immense practical importance, and so few comparatively of the pupils ever enter the high school, that we regard as desirable some attempt to teach the rudiments of the subject in the grammar, and even in the primary schools.

They recommend the introduction of exceedingly rudimentary courses in physics and chemistry in the highest grades of the grammar school, and further, as perhaps the most desirable branches of science to be included in the classical courses in the high school, and to be required for admission to college, physical geography, phænogamic botany, and human physiology. The first is suggested as tending to keep alive in the student's mind a sympathetic acquaintance with nature in its broader aspects; the second, as affording unequalled opportunities for discipline in observation; the third, as affording knowledge of the greatest practical importance.

The rudiments of physics and chemistry, which they propose for the grammar schools, will enable physical geography and physiology to be intelligently studied in the early years of the high-school course.

For the scholars in the English course in the high school, there will naturally be more advanced and systematic instruction in chemistry, physics, and zoology, and also instruction in geology and astronomy; but the classical students may with propriety leave these studies until they reach them in the college course. The scientific instruction they will have received in the primary and grammar schools, and the study of the three branches above specified in their high-school course, will be sufficient to preserve that natural and wholesome sympathy with nature the loss of which is now the main obstacle to the successful study of natural science in the colleges.

THE COAL QUESTION IN ENGLAND.

MR. R. Price Williams, M.Inst.C.E., read a paper on the "Coal Question" at the meeting of the Royal Statistical Society on Feb. 19. The following is an abstract of the paper as given in *Engineering*: —

After paying a well-deserved tribute to the labors of the late Professor Jevons in connection with this subject, the author shows, by a series of tabular statements and diagrams, the rapid increase in the coal-production of England prior and subsequent to the date of the coal commission in 1871. The Northumberland and Dur-

ham coal-field, as is pointed out, still gives to Newcastle its pre-eminence as the chief source of the coal-supply, the output last year from Durham alone amounting to over 28,750,000 tons, or to more than one-sixth of the total production in the United Kingdom. Attention is drawn to the fact that during the last four or five years there has been a considerable decrease in the output from these northern coal-fields; and the maximum limit of the coal-production it is considered has been reached, and henceforward it will continue to decline. It is shown, that, at the average rate of increased production during the last twenty-two years, the 9,294,000,000 tons of available supply would be entirely exhausted in about ninety-four years.

The author devotes a considerable part of his paper to the South Wales coal-field, — a district he is well acquainted with, — and attention is directed to the remarkable development which has occurred during the last few years in the South Wales steam coal-trade, the 26,000,000 tons produced last year coming next in amount to that of Durham. This large quantity is shown (after allowance is made for waste in working) to represent about 5,381 acres of a four-foot-thick coal-seam practically worked out in the course of a single year. The total available supply in the South Wales coal-basin is estimated by the coal commissioners at 36,566,000,000 tons, or just one-third of the whole available supply in the United Kingdom, which, at the rapid rate of increased production which has obtained during the last quarter of a century, would, as the author shows, be entirely exhausted in the short space of seventy-nine years.

The rapid development in the coal-production in the eastern division of this coal-field, which contains the famous steam coal-measures, is strikingly shown by the enormous growth of the coal-exports from Cardiff, more especially to foreign countries. In 1864 these only amounted to 1,500,000 tons, doubled in the next ten years, and again doubled in the following seven years; while in 1887 they amounted to 8,250,000 tons, or to more than a third of the entire coal-exports for the United Kingdom for that year.

Two-thirds of the South Wales coal-supply is obtained from Glamorganshire, more particularly from the eastern division, containing these valuable steam coal-seams. The author shows, that, if the production from this eastern portion of the coal-basin continues to increase at the average rate it has done during the last twenty-four years, the whole available supply, which the coal commissioners estimated at 12,963,000,000 tons, will be entirely worked out in the course of the next sixty years; and the portion containing the lower or steam coal-seams, in the short space of forty-two years.

The coal exported from Cardiff, consisting chiefly of this high class of coal, the author points out, represents, after making allowance for waste in working, about seven acres of the famous four-foot steam coal-seam entirely worked out during each working day of the year.

The coal-productions from all the other principal coal-fields are separately dealt with; and the dates at which, at the average increased rate of output during the last twenty-four years, they will become exhausted, are given in the following summary: —

	Years.
Northumberland and Durham	94
South Wales.....	79
South Wales (eastern division)	46
Lancashire and Cheshire.....	74
Yorkshire, Derbyshire, and Nottingham.....	90
Warwickshire.....	53
Denbighshire and Flintshire.....	250
Scotland	92
United Kingdom.....	102

Under the head of coal-consumption, particulars are given of the chief uses to which the coal is applied, from which it appears that the coal consumed in the manufacture of pig iron, and in the manufacture of merchant iron and steel of various kinds, amounted at the time of the coal commission to nearly one-third of the coal produced in the United Kingdom. The large economies since effected by the Bessemer, Siemens, and other processes, are shown, however, to have reduced the consumption in 1887 to little more than 16 per cent of the coal-production. Attention is drawn to the large economies effected and to be effected by the use of compound

engines for steam navigation and locomotive purposes. The amount of coal used by ocean-going steamers during 1887 amounted to nearly 7,000,000 tons, and that consumed by the much larger number of steamers engaged in the coasting trade is estimated to have equalled that amount. The coal consumed by the locomotives on the railways in England in the same year is shown to have exceeded 6,000,000 tons.

Particular attention is drawn to the very rapid growth of the export of coal, which has increased from 4,333,333½ tons in 1854, to over 27,000,000 in 1888. The author considers it is but the measure of increased commercial prosperity, and that to impose any tax upon such exports would be like killing the goose that lays the golden eggs.

The author, in his concluding remarks, observes, that, if the growth of the trade and prosperity of England is to continue as it has done in the past, its coal-production, which is at once the cause and effect of this growth, must necessarily keep pace with it; and it is pointed out that unless large economies, which can and ought to be effected in its consumption, are realized, all the largest and best sources of the coal-supply will be exhausted in the very short periods mentioned in this paper. The hope is expressed, that, by drawing attention to this most vital subject, further strenuous efforts may be made to husband English coal resources in every possible way, and to put a stop to the great waste in working the mines, and in the consumption of coal generally.

MINING INDUSTRIES IN SIAM.

SIAM is rich in minerals. Gold, iron, tin, and copper are found in many parts of the country; but the want of roads, and consequent difficulty of getting these metals to market, prevent their being worked, except for the limited wants of the natives.

The English consul at Bangkok, Mr. Child, says, in his last report, an abstract of which appears in the *Journal of the Society of Arts* for Feb. 22, that the eastern part of Siam is very rich in iron, antimony, and argentiferous copper and tin. It is from the provinces of Petchaboon and Löm that the cutlasses, spears, and knives are furnished to all the provinces of the north and east. Silver is not found in Siam.

As regards gold, this metal is found in many places, but the mines at Bang Tapan on the west coast are said to contain the purest gold in the country. They have been worked by the natives by simply turning over the ground, the gold being found in the shape of nuggets. When nuggets over a certain size were found, the miners were obliged to hand them over to the government, but they were paid for the same according to a tariff fixed by the authorities.

A syndicate of foreigners has been formed, with a concession from the king, for working these mines, and has now a number of workmen employed, the prospects for rich developments being good.

The quartz-mines of Muang Krabin, although productive, were declared unprofitable to the government. Experienced engineers from Australia, mining machinery of recent invention, immense upright pumps and other hydraulic machinery, and a narrow-gauge railroad with rolling stock for the conveyance of the product, had been procured for the working of the mine; but, the organizer of the great scheme having been decapitated for alleged treason, the whole of the plant is lying idle.

The royal metal of Siam is mostly manufactured into vases, tea-pots, betel-boxes, and other articles, which it is the custom of the kings of Siam to present to subjects upon their elevation to high rank in the peerage of the kingdom. They are looked upon in a sense as insignia of their exalted rank, the shape and style of the set denoting the standing of the beneficiary.

It is impossible to procure statistics concerning the output of the mines. Iron of good quality is found in the eastern provinces, but it is worked in a very crude and primitive manner. Foundries are unknown. A hole or pit having been dug close to the mountain, the miner collects and piles up his ore, which he smelts with charcoal. The molten metal is deposited in a cavity prepared for its reception, and when cold the product is carried home.

There a fire is prepared, which is kept alive by a bellows made of two trunks of hollow trees buried in the ground, and having two long sticks as handles. A child works the bellows, while husband and wife or son hammer the iron into shape.

The knife, cutlass, spear, or agricultural implement produced by this combined labor finds a ready sale throughout the north of Siam, and, although the workmanship is poor, it suits the requirements of that section. The locality of the mines preclude shipments to Bangkok, as it would have to be conveyed to the river on elephants,—a method of conveyance too expensive for the commodity.

Tin is found in profusion in the Malayan peninsula, and is worked by Chinamen. It is generally exported direct to Singapore from the locality in which it is mined. Tin is also found in eastern Siam to a limited extent, but none of it finds its way to the capital.

Copper is found in certain localities, especially in the eastern provinces,—Champasak, Petchaboon, and Löm. In the former province, on the Makong River, there is a place where the natives procure the finest metal, of which they make a coin that passes current in that locality. It is about two inches in length, a quarter of an inch in breadth, and shaped like a canoe. The province adjoining that has an iron coin of the same shape, but larger in size. Virgin copper is held in great esteem by many for certain qualities it is supposed to possess when employed as an agent in transmuting metals. Without it as a basis, the native alchemists claim that gold cannot be obtained.

Coal is found on the coast and in the interior, but cannot be utilized. Limestone is brought to Bangkok from the interior. The lime is mixed with turmeric, and is used to a large extent by the Siamese in combination with the betel-nut and *seri* (pepper-leaf).

Precious stones come principally from the province of Chantibun; rubies, sapphires, topaz, asterias, and other stones being found in that district. The diamond is unknown as a native stone. The sapphire mines to the south of Chantibun, to which thousands of Burmese flocked a few years ago, have been exhausted.

BOOK-REVIEWS.

Popular Lectures and Addresses. By SIR WILLIAM THOMSON. In 3 vols. Vol. I. Constitution of Matter. London and New York, Macmillan. 12°. \$2.

THE author of this work possesses in an eminent degree the ability of putting into untechnical language those essentials of knowledge which are most interesting and attractive, and at the same time most useful, to the general reader. Among the contents of this volume may be mentioned "Capillary Attraction," which was originally delivered as a lecture before the Royal Institution in 1886; to which are added three appendixes treating of certain curious motions observable on the surfaces of wines and other alcoholic liquors, gravity and cohesion, and the equilibrium of vapor at a curved surface of liquid.

Shortly after the delivery of this lecture, it was suggested to Mr. Thomson that it might be advisable to make it more conveniently accessible to the general public than it could be in the "Transactions of the Royal Institution;" and it was accordingly arranged to bring out, as one of the Nature Series, a small volume containing the lecture mentioned, together with several other papers pertinent to the subject. While the volume was in course of preparation, it was decided to increase the size of it, adding several other lectures and addresses to the contents, and make it the first of a series of three volumes, constituting a reprint, in a revised form, of all Sir William's popular lectures and addresses. The result is the volume before us, the first volume of the series.

Besides the lecture already spoken of, a chapter each is devoted to the following subjects: "Electrical Units of Measurement," "The Sorting Demon of Maxwell," "Elasticity viewed as possibly a Mode of Motion," "The Size of Atoms," "Steps towards a Kinetic Theory of Matter," "The Six Gateways of Knowledge," "The Wave Theory of Light," "The Age of the Sun's Heat," and "Electrical Measurement." These were originally delivered as lectures and addresses before the Royal Institution, the Institution of Civil Engineers, the British Association, and the Franklin In-

stitute of Philadelphia. The chapter on "The Age of the Sun's Heat" is reprinted from *Macmillan's Magazine*, and consists of three parts, treating respectively of the secular cooling of the sun, the sun's present temperature, and the origin and total amount of the sun's heat.

The Psychic Life of Micro-organisms: a Study in Experimental Psychology. By ALFRED BINET. Tr. by Thomas McCormack. Chicago, The Open Court Publ. Co. 12°. 75 cents.

IT may, perhaps, not be rash to venture the statement that in no field of study has the introduction of the comparative method been so helpful as in the study of mental phenomena; of the coordinations between the organism and the environment. It is this that has widened the horizon of the psychologist from the observation of his own individual, adult, civilized consciousness, to the observation of other men and of other races in different stages of civilization, of other ancestries, of other no less interesting though more lowly forms of life, of the embryonic, immature stages of development. It is to the apparently most insignificant group of such phenomena that M. Binet devotes his monograph,—to the psychic life of the lowliest denizens of the earth, forms so simple that even the distinction between animal and vegetable becomes doubtful when their classification is attempted. Many a reader would perhaps be likely to think that an account of the psychic life of micro-organisms might be as brief as that celebrated essay on the snakes of Greenland, which was all contained in the sentence, "There are no snakes in Greenland." M. Binet shows most conclusively, however, that there is psychic life in these unicellular specks of protoplasm; that they exhibit relations to their environment similar in kind, though vastly inferior in degree, to those to which we unhesitatingly attribute an intellectual origin, when we observe them in ourselves or any of the higher animals.

M. Binet classifies these evidences of embryological mental activity into (1) those connected with motion and sensation, (2) those connected with nutrition, (3) those connected with reproduction, and (4) those connected with "social relations." Under the first head we observe that the *Didinium nasutum* (a type of the ciliated infusoria) has the power of reversing its motion, of arresting it, and that for this purpose it makes use of a perfect miniature steering apparatus. We note, too, that the most rudimentary sensation is that of contact, many of these microscopic animals having no other; that after this, sight develops, it being not improbable that certain vegetable forms possess the analogue of an eye. The *Didinium* has vision enough to hurl a shower of darts at its prey, thus paralyzing it, and making it an easy victim; while the *Euglenæ* are sufficiently sensible to color to constantly congregate between the lines F and G of the solar spectrum. The maintenance of life is always the result of a re-action to the environment, and in this "life of relation" a psychic element must enter. In the motions necessary to seize the prey, in the power of selection that enables the organism to seize certain particles and reject others, we have a rudimentary form of choice. In the recognition of the position of the desired food, M. Binet does not hesitate to detect an elementary space-perception. The excitement preceding the times for copulation shown by unicellular organisms suggests an analogue to the emotions. Under the fourth head belongs the formation of a group of cells into a colony, in which the individuals act harmoniously, and each contributes to the general welfare.

These are only a few of the very suggestive observations and comments that M. Binet brings together; and if from the rest of the work a single example of the possibilities this study reveals must be selected, it should be the experiments of Professor Pfeffer on the spermatozooids of ferns. This observer finds that when a solution of malic acid is held in a tube, and a similar solution of one-thirtieth the strength be placed in a watch-crystal in which are the spermatozooids, the latter will leave the watch-crystal for the tube; and not only this, but when the solution in the tube is only twenty times as strong, these organisms remain unaffected. It seems to be the ratio of the intensities of the two solutions that brings about the result, and in this Professor Pfeffer sees an undoubted analogy to the psychophysics law illustrated in the power to distinguish between sensations as tested by Weber, Fechner, and

others. If this law can be thus corroborated, it is a wonderful law indeed.

The general position of M. Binet is thus somewhat in opposition to current views. He combats the view that in the unicellular organisms we have a simple and blind mechanical reflex action between irritable substances and an irritating environment, but holds that rudimentary forms of various psychic functions take their origin here. He pronounces Mr. Romanes' attempt to fix the grade at which the several constituents of psychic function enter into play as artificial and arbitrary, and believes that a more complete study of these lowliest forms of life will establish a more rigid and scientific criterion of mind, and show the substantial unity and primordially of the psychic element. It is certainly a long step from the days when man was defined as a rational animal, denying by inference, to the rest of creation, a share in this possession, to the days when what we can see only with the aid of the most improved results of science is pronounced akin to the most human part of man.

AMONG THE PUBLISHERS.

THE *Atlantic* for March contains an article by Stuart F. Weld, on "The Isthmus Canal and Our Government," which will interest students of politics. The author is strongly in favor of placing the canal under international control, as the Suez Canal has already been placed; and he shows, by quotations from public documents, that our own government has always been in favor of such control, except during a brief period beginning with the administration of President Garfield. Another article of interest is "Personal Reminiscences of William H. Seward," by Mr. and Mrs. Samuel J. Barrows. Mr. Barrows was for a time private secretary to Mr. Seward at the State Department, and during an illness of some months his wife took his place. Hence they have much to tell us about the statesman's official and private life, and they tell it in a simple and pleasant way. Mr. John Fiske continues his articles on American revolutionary history, treating in his usual excellent style of "Ticonderoga, Bennington, and Oriskany." The *Atlantic* has also a paper on "Some Colonial Lawyers and Their Work," by Frank G. Cook, which lawyers will like to read, and the usual variety of lighter articles.

—Mr. John Delay of this city has begun the publication of a series of Gleanings from Foreign Authors, the first number of which now lies before us. It contains "A Love Match," translated from Ludovic Halévy, and "King Apepi," by Victor Cherbuliez. The former is a very pleasant little love-story told by the lovers themselves in extracts from their diaries, which they read to each other after their marriage. The other is less agreeable as a whole, but ends in an amusing and unexpected way. We are not told whether the whole series of which this book is the beginning is to consist of novels, but they will doubtless constitute the greater part; and, if the other volumes are up to the level of this one, they will make an addition to the lighter literature of English readers.

—*Outing* for March is a sporting number. We note the following principal articles: "Fox-Hunting; A Day in the Shires," by Henry H. L. Pearce; "Lawn Tennis in the South," by Henry W. Slocum, jun.; "Snowshoeing in Canuckia," by James C. Allan; "Salmon-Fishing on Loch Tay," by "Rockwood," and illustrated by J. & G. Temple; "Spaniel-Training," by D. Boulton Herrald; "How to Cycle in Europe," by Joseph Pennell; "Amateur Photography," by Ellerslie Wallace; "Winter Shooting in Florida," by F. Campbell Moller; and "Coaching and Coaching Clubs," by Charles S. Pelham-Clinton.

—A catalogue of the contents of the *Magazine of American History* for March reveals great current interest. The leading article describes the "Historic Homes and Landmarks" about the Battery and Bowling Green, New York City. The whole procession of Dutch and English governors who resided in the old historic fort opposite the Bowling Green are passed in review, as well as those who lived in the house built for Washington on the same site. One of its features is the sketch of the site of the City Hotel, of

which so little is generally known. The second article, "America: the World's Puzzle in Geography," is a study by Rev. William Barrows, D.D. President James C. Welling, of the Columbian University, Washington, D.C., replies to Gen. Wilcox in an article on "The Mecklenburg Declaration of Independence;" the well-known author, J. G. Rosengarten, contributes "Du Pont De Nemours;" Gen. Alfred E. Lee discourses upon "German Family and Social Life;" Mr. Maturin L. Delafield writes of Col. Henry Beekman Livingston; and Annie E. Wilson gives an authoritative paper entitled "Thrilling Adventure of a Kentucky Pioneer."

—"The Century Dictionary" is to contain some features new in dictionaries, one of which is the entry of every thing in the one alphabetical order, abbreviations and foreign phrases as well as common words. While the plan of the work excludes biographical and geographical names, yet such adjectives as "Chinese," "Darwinian," etc., derived from proper names, will find place, and be fully defined. A great point with the new dictionary is its encyclopedic treatment of words. It will not stop at definitions, but is said to go into particulars about things to a greater extent than any other book except an encyclopædia, and it gives the information in a condensed, usable form. Such terms as "Bright's disease," "Tweed Case," "electric light," etc., are defined under the words "disease," "case," "electric," etc. Under "case" there are twenty-seven entries of such terms as "Dred Scott Case," "Tichborne Case," etc., in addition to the etymologies and definitions usually to be found in a dictionary. Such terms as "credit mobilier," "bankruptcy laws," "crossed checks," "clearing-house system;" the names of foreign administrative divisions, such as "arrondissement;" legislative bodies, like the "Cortes" and "Bundesthag;" parties and classes, such as "Anarchist," "Nihilist," "Chartist," "Fenian," "Carbonari," etc.,—will be fully defined in "The Century Dictionary;" and it is even understood that the new use of "barrel" ("the money, especially when the sum is large, supplied by a candidate in a political campaign for campaign purposes, but especially for corrupt purposes, etc.") has found a place.

—In the twenty-four years since the late Mr. N. Trübner began to carry out, under the title of *The American and Oriental Literary Record*, the idea of supplying periodically, not only lists of books published in the various countries of the East and throughout the whole of the American continent, as well as of European works bearing upon those countries, but also literary information on books and their authors, the value and usefulness of the *Record* have been fully recognized throughout the literary world. The growing importance and rapid spread of scientific research in the United States on the one hand, and the ever-increasing interest which literary men in England take in the history, antiquities, and civilization of the East on the other, have made it appear desirable to the publishers to expand the original design of the *Record* by assigning ample space to literary and scientific articles on subjects within its scope. They are making this departure with the greater confidence of success, as there is no other periodical in the English language which offers such a solid and comprehensive programme; and, while they invite the co-operation of scholars in the special departments to which their studies are directed, they look forward for continued support to the literary public generally, who have for so many years accorded to the *Record* their signal approbation and patronage. With a view to securing, as far as practicable, the indispensable superintendence by a competent and experienced editor, of the Oriental section of the expanded issue, they have made arrangements with Dr. Rost, of the India office, to undertake the editorial management; and they are confident, that, in intrusting this department to his care, they can rely upon its being directed with impartiality and independence of judgment. In addition to personal notices, such as obituaries and literary notes of works projected or in progress, the publishers intend to devote more space to reviews, independent articles on Oriental subjects, and more especially to periodical statements as to the advance made in the various fields of Oriental research, so as to make the *Record* a depository of information concerning the current state of Eastern literature in all its branches. It is proposed as a first and tentative venture to issue six numbers

annually, which will be published regularly in the middle of every alternate month, each issue to be a full record of the events of the two preceding calendar months. But the publishers hope that they will soon be enabled to issue the *Record* monthly. This, of course, will depend upon the success of their venture. The price of the new series, the first number of which will appear on the 15th of March, 1889, will be ten shillings per annum, payable in advance, or two shillings per number.

—The *Electrical World*, March 2, says: "Last week we reached our highest water-mark, up to that time, in an issue of 72 pages, the size and contents being such as to bring in upon us overwhelming congratulations from friends and readers all over the country. Marking as it did the close of our fifteenth year, the issue was naturally taken as a good exemplification of the great growth of electrical science and industry in the period since the first number was published in 1874; and we felt that at so memorable a milestone on the road of progress we might fairly take the advice once given by a famous statesman after a noteworthy achievement, and 'rest and be thankful.' But we are called upon this week once more to meet larger demands, and, rising to the occasion, we now put forth a number containing no fewer than 96 pages, or a gain of 24 pages over the previous record of a single week before. We cannot but call attention to a stride so tremendous. There is no need for us to enlarge upon it, or to emphasize its importance as evidence of the enterprise of electrical journalism in America, and the vast extent attained by the department represented in the arts and sciences. The number speaks for itself, from the first line to the last, and, big as it is, we know that every page will be turned and read with interest." Notwithstanding the fact that a full report of the Electric Light Convention was given, the current electric news was not neglected.

—The *Forum* for March contains the first of a series of essays on the fine arts. It is by Charles Elliot Norton, and is an attempt to give a definition of the fine arts,—a task of no small difficulty. The author thinks they may be defined as "the arts of expression in forms of beauty created by the imagination," and supports this view by an able discussion. He holds that these arts are "the only real test of the spiritual qualities of a race;" and he has some very uncomplimentary but, we fear, very true remarks about the deficiencies in this respect of the American race. Another article in the *Forum* which at first attracts attention is that by Cardinal Manning on "The Bible in the Public Schools;" but the article itself is disappointing. It is little more than a tirade against the public schools themselves as being irreligious; and, as for the reading of the Bible in the public schools of this country, he opposes it, though he is glad it is read in the schools of England. Mr. St. George Mivart has an article on "Darwin's Brilliant Fallacy," in which he reiterates his well-known views in opposition to the theory of "accidental variations," holding that a new species arises from "pre-ordained, definite variations due to the spontaneous re-action of the innermost nature of an organism." The article contains nothing particularly new, but in another paper the author promises to consider the subject of human reason, and to show that its origin is not explainable by Darwinism. Besides these papers, the *Forum* has one by Miss Kate Stephens on "Advanced Education for Women," showing the rapid progress that such education is making; another by Dr. Bacon, advocating the delivery of letters by carriers from every post-office in the Union; and other articles on various topics, which we have not space to particularize.

—Roberts Brothers will soon publish a new edition of "A Modern Mephistopheles," which first appeared in the No Name Series. The author's name, Louisa M. Alcott, is now printed on the title-page for the first time. It was one of the famous No Names, the authorship of which was never guessed by any one. The story resembled Hawthorne's style so much, that at its publication many attributed it to him. Appended to the volume is another story called "A Whisper in the Dark,"—a story written many years ago, but which never appeared in book-form.

—The *Revue Scientifique* proposes to open its columns to a symposium of facts relating to heredity in man. Its object is to collect reliable instances of unusual cases of heredity, and to subject the material thus gathered to a rigid analysis, in the hope of

shedding new light on this most important topic. The editor of the *Revue*, M. Ch. Richet, the well-known physiologist and psychologist, requests that all who have facts to present will send them to him. His address is 111 Boulevard Saint-Germain, Paris, France.

— Harper & Brothers have just ready "The Correspondence of John Lothrop Motley," edited by George William Curtis. Mr. Motley's daughters have collected these letters, chiefly addressed to the writer's family and to Oliver Wendell Holmes. They contain the autobiography of one of the most striking figures in American literary history. The author of "The Rise of the Dutch Republic," "History of the United Netherlands," and "The Life and Death of John of Barneveld," studied the history of liberty in an essentially American spirit. Wendell Phillips was his school chum, Bismarck his fellow-student at Göttingen; and as United States minister to London, Holland, and Austria, he made personal friends of all the literary and political celebrities of his day. Few lives have been so full of incident of universal interest. The work is in two volumes, and has a portrait.

— The Leonard Scott Publication Company (New York, 29 Park Row) has reprinted the famous Bismarck Dynasty article from the *Contemporary Review* for February (price 15 cents), a large special edition of that number having been exhausted on the day of publication. The authorship of the article continues to be the theme of much speculation in England. The Empress Frederick has thought it necessary to disclaim it, and so has Sir Morell Mackenzie. Many of those who claim to know, attribute it to Mr. Stead, the editor of the *Pall Mall Gazette*. Mr. Labouchere says he almost knows it was Mr. Stead, and sundry characteristics can be pointed out which lend color to this view. In the mean time eight editions of the *Review* have been called for in England.

— A novel feature in magazine literature was introduced in the *Nineteenth Century* for February. The editor has invited a number of his friends to send him from time to time, in the shape of letters to himself, remarks upon any books which in the ordinary and natural course of their reading may strike them as being worth special attention. He has suggested to them, that, whenever a book is thus met with, a letter about it should be written to him, giving the same advice as to a friend, and in much the same sort of easy fashion. He hopes in this way to obtain fresher and more spontaneous criticism than can possibly be always produced under the prevailing system of "noticing" books "sent for review." The first instalment of this series consists of a notice of Margaret Lee's novel "Divorce," by Mr. Gladstone; of the "Lyrics," and "A Village Tragedy" by Margaret Woods, by Frederick Harrison; Dean Burgon's "Lives of Twelve Good Men," by P. E. Prothero; Sir George Young's "Sophocles," in English, by W. S. Lilly; "Notes of Conversations with the Duke of Wellington," by Augustine Birrell; Miss Rives's "The Quick or the Dead?" and "Virginia of Virginia," by Hamilton Aide; M. Jusserand's "Wayfaring Life," by the Rev. Dr. Jessopp; and George Pellew's "In Castle and Cabin," by John Morley.

— The New England Publishing Company have just published "One Hundred Lessons in Composition," by W. H. Huston of Toronto, which contains 400 practical exercises in composition, and is the sixth volume in their library of Teachers' Help Manuals. It will shortly be followed by "Manual of Rhymes, Selections, and Phrases," by Oscar Fay Adams; "Forty Friday Afternoons," by forty prominent masters, each giving what he considered his best exercises for a Friday afternoon; and "Common-Sense Exercises in Geography," a book of exercises — not questions — adapted to all grades and to the best American text-books. They have also just ready "School Music," by W. S. Tilden, of the State Normal School, Framingham, Mass., a series of papers from the *American Teacher*.

— The *Critic* observed the seventieth anniversary of the birth of Mr. Lowell, which occurred on Feb. 22, by printing seventy letters and poems from American and English men and women of letters, among whom are Tennyson, Whittier, Gladstone, Holmes, and Stedman.

— Mrs. Frank Leslie has sold to W. J. Arkell, of *Judge*, her *Frank Leslie's Illustrated Newspaper*, both English and German,

the transfers to be made May 1. Mrs. Leslie will retain and personally direct her other publications.

— Emin Pacha forms the subject of a paper by Elbridge S. Brooks in the February *Wide Awake*.

LETTERS TO THE EDITOR.

* * * Correspondents are requested to be as brief as possible. The writer's name is in all cases required as proof of good faith.
The editor will be glad to publish any queries consonant with the character of the journal.

The Soaring of Birds

MAY I ask space for a few comments on Professor W. H. Pickering's letter on the above subject, in *Science* of Feb. 22?

Professor Pickering holds that a bird which is moving with motionless wings in a horizontal wind is acted upon by three forces: (1) its weight; (2) a force "due to the excess of the velocity of the wind over the velocity of the bird," by which, since it is represented as horizontal and to leeward in his diagram, I suppose he means the friction between bird and wind; and (3) a force "due to the resistance of the air acting on the wings of the bird," which I take to mean the force derived from the impact of the air particles on the wings. This third force he assumes to have a direction opposite to that of the resultant of forces (1) and (2), and therefore to have one component vertically upward, and another to windward. This assumption seems to me to be erroneous. The horizontal component of such a force must surely be to leeward, as was pointed out by Hubert Airy in *Nature*, xxvii. p. 336; and the inaccuracy of this fundamental assumption of Professor Pickering would seem to invalidate his whole argument.

But let us follow it further. Force (3), he says, depends on the velocities of bird and wind, and he assumes first that these velocities are such that it is equal to the resultant of forces (1) and (2). In that case he says the forces acting on the bird will be in equilibrium. They would be, certainly, if the above assumption were true. "The bird," he then says, "will therefore continue to revolve about its mean position." How can a body which is in equilibrium revolve about a mean position? It must surely move with a uniform velocity in a straight line. He says again, "While these forces are in equilibrium, the bird is slowly drifting in the same direction as the wind." Why so? If the bird is in equilibrium, he must have the same velocity as he had at the instant at which he came to be in equilibrium, and that may or may not have had the same direction as the wind. In fact, if it is true, as Professor Pickering assumes, that the forces acting on the bird can be in equilibrium, the bird can move to any distance, in any direction whatever, with motionless wings. He has but to get up a velocity in the desired direction by using his wings, and then to poise his wings so that the forces acting on him may be in equilibrium. Since this result is contrary to experience, it makes the possibility of the bird's being in equilibrium under the given conditions doubtful; and it is obvious, that if force (3) has a leeward component, as I hold it must, its being equal to the resultant of (1) and (2) does not involve the vanishing of the resultant of all three; indeed, that whatever assumption may be made as to the magnitude of (3), the resultant of (1), (2), and (3) cannot possibly be zero.

Finally, Professor Pickering assumes the velocities of wind and bird to be such as to make force (3) greater than the resultant of (1) and (2). In that case, if the assumption criticised above were correct, the bird would be acted upon by a resultant force directed upwards and to windward, as Professor Pickering states. But if force (3) is directed upwards and to leeward, it will be obvious that the resultant force on the bird will be necessarily directed to leeward, and will not necessarily be directed upwards; and it follows, that, even if the velocities of wind and bird be assumed to be such that force (3) is greater than the resultant of (1) and (2), the bird's path will not necessarily have a general upward direction.

J. G. MACGREGOR.

Dalhousie College, Halifax, N.S., Feb. 27.

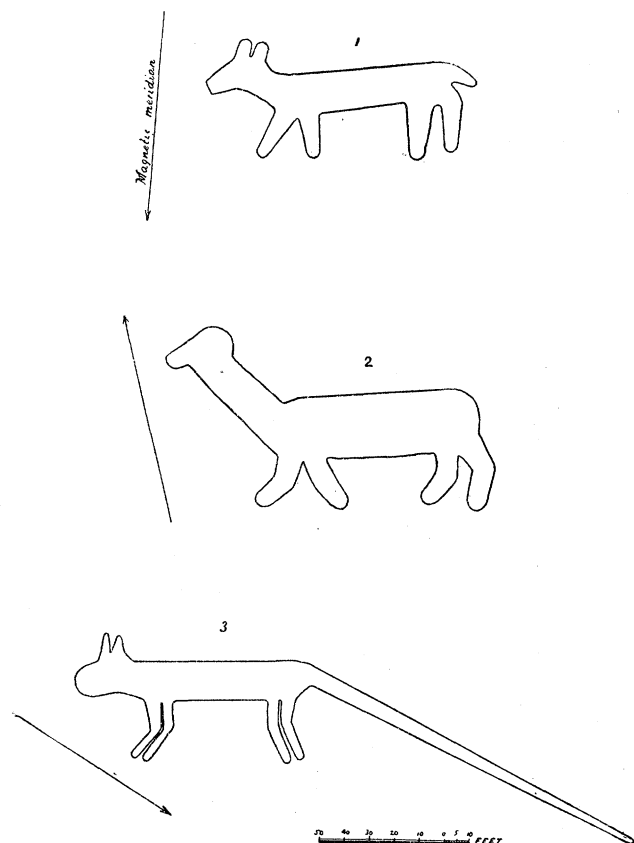
A New Departure in Effigy Mounds.

IT was first asserted by Dr. J. M. De Hart that there are to be found exceptions to the ordinary rule followed by the mound-builders in the outlines of their quadruped animals; i.e., that in-

stead of portraying them with legs in range of the eye, so that only two are visible, there are cases in which all four legs are shown. This statement occurred in an article written by him on the mound-builders of Wisconsin, which appeared in the "Proceedings of the Wisconsin Academy of Sciences for 1876-77;" and he furnished illustrations of two such animals which he found on the northern shore of Lake, or Fourth Lake, opposite Madison. One of them he considered to represent a deer with divided horns: the other he called a bear.

Now, this report of his did not go uncontradicted; for it was maintained some years later by a writer in the *American Antiquarian* (vi. p. 13), that "there is in the mound no such divisions in the legs or horns," and the doubt is also expressed "whether any effigy intended to represent a deer ever had the horns separate, as this has." Dr. De Hart does not seem to have written in defence of his position, and no one hitherto seems to have taken up the cudgels in his behalf. For my part, until last year, I shared equally in the doubts of the second writer, because, in addition to scrutinizing all the drawings of effigies by Mr. Lapham and others contained in the "Antiquities of Wisconsin," together with a few subsequent incidental surveys of similar figures, I had personally examined some hundreds of original effigies in the field, without being able to find a case of divided legs.

When visiting the Four Lake country last summer, I did not fail to search for, and find, the two effigies delineated by the doctor, which are on the grounds of the insane-asylum. The result of the examination did not entirely confirm his statement; for, though the "deer's" legs are most decidedly apart, there is no division of the horns into antlers that I could discern. The following descriptions,



with outline diagrams plotted from my surveys, are now submitted to the archæological world to substantiate the position taken.

The deer, so called (No. 1), is situated to the right of the road running from the asylum to the lake, and about equidistant from each. Its greatest length from the muzzle to the end of the tail is 108.5 feet, and the body is 1.5 feet high. Its horns or ears, whichever they may be, are divided into two sections, but there is no

subdivision. There are several other effigies and a number of round mounds and embankments belonging to this group, but they are being gradually defaced and worn away by the patients passing back and forth over them in their daily walks.

On the same occasion I also found another four-legged animal (No. 2) not hitherto mentioned by any one. It is on the north side of Lake Wingra, nearly five miles distant as the crow flies, in a southerly direction from the one first described. The length of this effigy from the extremity of the muzzle to the rump is 127 feet, its body is 3 feet in height, and the legs are bent as if in motion. Last August, when I made the survey, it was in a fine state of preservation, the base outline being well defined. It is located on a knoll about twenty feet above the lake, less than one hundred feet from the shore; and on a high ridge above and to the east of it there are numerous round mounds, embankments, and effigies.

Leaving the vicinity of Madison, a north-westerly course in an air line of about 117 miles by the map brings us to a place where there is another effigy belonging to the same class (No. 3). It is located on the farm of Mr. George Gale on the N $\frac{1}{2}$ of section 10, township 18, range 8, on the west side of Black River, in Trempealeau County, Wis., within seven miles of the Mississippi River to the south-west. Its length from the muzzle to the tip of the tail, in an air line, is 234 feet, and the body is 2.5 feet in height. In this case, also, the horns, if such they be, are divided. The fore-legs are bent forward, and the hind-legs backward, which is probably intended to convey the idea that the animal is in motion. The tail is 144 feet in length, being just one and a half times that of the body and head combined. In addition to this one, there are four other effigies and several round mounds and embankments belonging to the same group, all of which were in a fine state of preservation last November, when my survey was made.

While these three examples, representing probably very different animals, are entirely unlike each other generally, they are yet fully sufficient to establish a class of four-legged ones; and probably by continued research others could be found in the same regions.

It may be further noted, in connection with these earthen effigies, that occasionally carvings or etchings are found on the sides of rocks and caves in Trempealeau and adjoining counties, which represent a great variety of figures of various kinds, and that among them are found some animals with two and others with four legs. The more interesting specimens of work have been copied by me. Although they may have been carved by another race, yet the fact still remains that both the artists in earth and the artists in stone adopted the same plan of outlines, but among the carvings there is by far the largest proportion of four-legged animals.

Whether this departure from a supposed rule be symptomatic of any incipient æsthetic evolution or not, and whether such construction of figures with legs apart preceded, was contemporaneous with, or succeeded, the similarly shaped carvings on the rocks, are questions which must be left to the future to answer.

T. H. LEWIS.

St. Paul, Minn., Feb. 27.

Queries.

42. LOOKING TO THE LEFT. — A writer in a recent number of the *Albany Argus* asks, "Why do theatre-goers prefer seats on the right of the house?" and suggests that when we are on the street we pass persons to the right and look to the left; that twenty-five or thirty years of this sort of thing naturally gets one accustomed to it; and, finally, that if one were to sit for two hours and a half or three hours in one position, if he has to keep his eyes to the right, he will find that it tires the muscles of the eyes quite perceptibly. Is there any evidence that this explanation is well founded?

43. DIGESTION OF FOWLS. — Permit me to ask a few questions about the digestion of fowls. Do they pick up the little stones when chicks, that serve through life, or do they secrete an acid that gradually digests even the pebbles, or have they a normal condition which produces the gravel in their gizzards as it is required for digestion?

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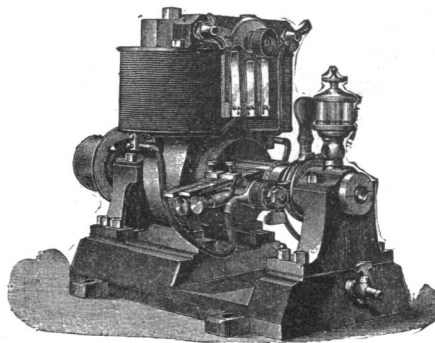
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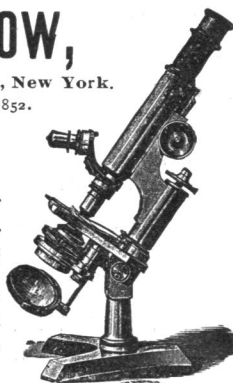
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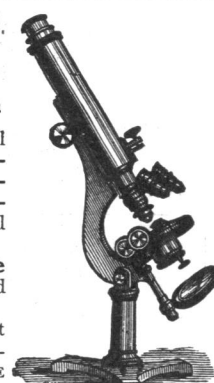
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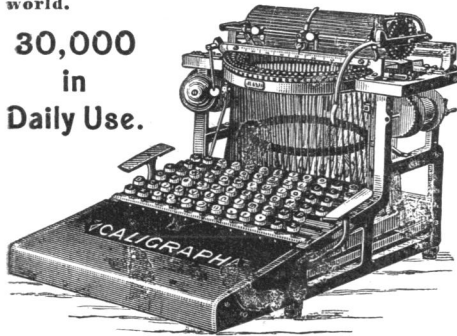
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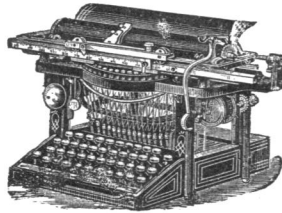
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